APPENDIX A

(Federal Circuit Decision)

UNITED STATES COURT OF APPEALS
FEDERAL CIRCUIT

99-1098, -1099, -1209, -1210

AJINOMOTO CO., INC.,
Plaintiff-Cross Appellant,

v.

ARCHER-DANIELS-MIDLAND CO.,
Defendant-Appellant.

DECIDED: October 3, 2000

Before NEWMAN, Circuit Judge, SMITH, Senior Circuit Judge, and RADER, Circuit Judge.

NEWMAN, Circuit Judge.

Archer-Daniels-Midland Company ("ADM") appeals the judgment of the United States District Court for the District of Delaware,[1] holding that ADM's use of certain strains of genetically modified bacteria to produce the amino acid threonine infringed Ajinomoto's United States Patent No. 4,278,765 ("the '765 patent") in terms of 35 U.S.C. § 271(g), and awarding damages calculated as a royalty of $1.23/kg of threonine produced by ADM from May 1993 to March 27,

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[1] *Ajinomoto Co. v. Archer Daniels Midland Co.*, 95-218-SLR (D. Del. Oct. 21, 1996 (denying summary judgment); Oct. 25, 1996 (claim construction); 1998 WL 151411, Mar. 13, 1998 (order and judgment); Oct. 7, 1998 (injunction; amended judgment); Dec. 28, 1998 (final judgment)).

1998. ADM also appeals the district court's ruling that the '765 patent is valid and enforceable. Ajinomoto cross-appeals the ruling that infringement was not willful. The judgment is affirmed, with modification of the damages period.

BACKGROUND

Threonine is an essential nutrient amino acid for many animals. It is not produced in the mammalian body and must be obtained from food. Bacteria, however, normally produce the amino acids needed for their own nutrition. The bacterial process, as it occurs in nature, is internally regulated to limit amino acid production to the amount and kind required by the bacteria for their metabolic functions, and the amino acids produced are degraded as they are metabolized. The '765 patent, entitled "Method for Preparing Bacterial Strains Which Produce Amino Acids," is directed to modification of the bacterial genetic structure in order to produce amino acids in increased quantities. The patented method is based on a combination of mutation genetics and recombinant DNA technology.[2]

The invention that is the subject of the '765 patent is the work of scientists at the Institute for Genetic Engineering and Industrial Microbiology ("Genetika") in the former Soviet Union. The patent describes and claims the modification of bacteria in order to block both the regulatory mechanism that limits amino acid production and the degradation pathway for the amino acid that is produced, leading to bacterial overproduction of the amino acid. That is, each bacterium produces more of the amino acid than it needs, and does not metabolize the excess amino acid that it produces. When conducted on a suitably large scale, commercial quantities of

[2] Mutation genetics involves mutating strains to produce random changes in the genetic material and then screening for the desired characteristics. Recombinant DNA technology involves specific alterations to the DNA, generally by removing or inserting fragments of DNA.

amino acid are obtained. Threonine is included in balanced animal feed suppiements, and is of commercial value.

The '765 patent describes a strain of E. coli bacteria that normally produces and consumes threonine. This strain was mutated to a strain that was "feedback resistant" to the production of threonine; that is, a strain that did not limit the amount of threonine produced to what was needed for the bacterial metabolism. From this mutant strain the portion of the chromosome containing the mutated gene controlling the synthesis of threonine was isolated. This chromosome fragment (called a threonine "operon") was then combined with a plasmid[3] that had been found to be suitable for inserting this genetic material into a host bacterium, to produce a "hybrid plasmid." The hybrid plasmid was then inserted into a "recipient" changed or mutated host bacterial strain that was modified to have two characteristics: it was incapable of producing the desired amino acid before insertion of the hybrid plasmid, and it contained a mutation that partly blocked its natural mechanisms for degrading the desired amino acid. The new bacterial strain thus formed, when placed in an appropriate medium, produces an excess of the desired amino acid. According to the record, this had never before been accomplished.

An application for an Inventors' Certificate was filed in the Soviet Union on June 30, 1978. A corresponding United States patent application was filed on June 28, 1979 and issued as the '765 patent on July 14, 1981. Ajinomoto is the owner of the '765 patent, having acquired Genetika's United States patent rights. Claims 1 and 2 of the '765 patent are in suit:

> 1. A method for preparing bacterial strains which produce aminoacids comprising

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[3] A "plasmid" is a DNA molecule that can act as a carrier of specified DNA inside a cell, and that replicates independently of the chromosome DNA of the cell.

combining a chromosome DNA fragment of a donor bacterium containing genes controlling the synthesis of a selected aminoacid and having a mutation which destroys the negative regulation of the synthesis of said aminoacid, with a plasmid DNA molecule capable of ensuring amplification, to form a hybrid DNA molecule;

transforming with said hybrid DNA molecule, cells of a recipient bacterial strain having a mutation blocking the synthesis of the selected aminoacid in said strain and a mutation partly blocking the related step of metabolism of said aminoacid,

to yield a bacterial strain possessing increased productivity of the selected aminoacid.

2. A method as claimed in claim 1, wherein for the removal of ballast genetic material, the hybrid DNA molecule is treated, prior to transforming cells of the recipient strain, with specific endonucleases ensuring cleavage of the hybrid molecule of DNA in predetermined sites of the molecule, followed by recombination and joining of the required DNA fragments with polynucleotide ligase.

In 1993 ADM, a producer of feed supplements for livestock, commenced the production of threonine using a bacterial strain that was made in Sweden by ABP International, a Genetika licensee using the Genetika process. ABP's license was territorial, and granted no rights in the United States. ADM purchased the bacterial strains and strain documentation and the right to use the bacteria for the production of threonine of feed grade quality, along with the specifications and operating manual for the design and construction of a plant to produce threonine using the designated process.

Ajinomoto sued ADM, invoking 35 U.S.C. § 271(g) and charging that the genetically engineered bacteria imported by ADM and used in the United States infringed the '765 patent because the bacteria were made by the method patented in the United States.

STANDING TO SUE

After trial was over, ADM challenged Ajinomoto's standing to sue for infringement of the '765 patent. ADM challenged the license to Ajinomoto from the Soviet licensing agency and the subsequent direct assignment by the inventors to Ajinomoto. The district court, despite finding that ADM had raised the issue tardily, considered the question in light of the information of record.

The district court determined that the Soviet government owned the Genetika invention and that Licensintorg, the Soviet government's technology licensing agency, had the right to grant a license to Ajinomoto. The court explained that "even though the Inventors' Certificate was issued in the names of the inventors, according to Soviet law, the invention became the property of the Soviet government." In 1991 the Russian state returned patent ownership and any license agreements to the various entities from which they originated. In May 1991 Genetika assigned the '765 patent to Ajinomoto, and in October 1991 the inventors executed an assignment directly to Ajinomoto. The district court found the evidence in the record sufficient to establish Ajinomoto's ownership of the '765 patent and its standing to sue for infringement.

We agree that the 1982 exclusive license from Licensintorg, in which no substantial right was retained by the Soviet government or any other entity, as well as the ensuing assignments of the ownership rights of Genetika and of the inventors, conveyed all substantial rights to the '765 patent. ADM argues that "the record contains no written transfer of title to the '765 patent from the inventors," apparently referring to transfer from the inventors to the Soviet state for

the purposes of Licensintorg's grant of an exclusive license to Ajinomoto in 1982. However, it is not disputed that the inventors were all employed at Genetika, a Soviet institution, and that they made the invention in the course of their employment. ADM argues that there is no evidence of record of Soviet law concerning the transfer of patent rights by employed inventors, including rights to foreign patents. However, ADM proffered no evidence and offered no argument of any flaw or illegality under Soviet law.

The district court observed that although "neither Ajinomoto nor the court was sufficiently put on notice that standing was a contested issue," standing was established by the evidence of record. ADM presented and presents no evidence to negate the unchallenged Licensintorg representations and grant of rights in the exclusive license agreement. It is well established that the holder of all substantial patent rights, by assignment or by exclusive license, has standing to sue for infringement in its own name. *See, e.g., Vaupel Textilmaschinen KG v. Meccanica Euro Italia S.P.A.*, 944 F.2d 870, 875, 20 USPQ2d 1045, 1049 (Fed.Cir.1991).

With respect to the assignment by the inventors, ADM argues that the recorded assignment was not entered into evidence, although it was identified on an exhibit list. The district court observed that ADM's delay in raising the standing issue until after trial "effectively prevented Ajinomoto from offering into evidence the pertinent provisions of Soviet law or the purported assignment to Ajinomoto by the inventors that is recorded in the PTO." We agree that ADM is now estopped to object that the recorded assignment was not entered into evidence; further, it is a public record of the United States Patent and Trademark Office, and its existence is not disputed.

A challenge to "standing," after standing has been prima facie established, requires some degree of plausibility.

Ajinomoto's complaint contained an appropriate statement of its standing, and the record before the district court identified the exclusive license agreement from Licensintorg, the assignment of this agreement to Genetika, the assignment of the patent from Genetika to Ajinomoto, and the assignment of the patent by the inventors to Ajinomoto. ADM presented no evidence to impugn the prima facie effectiveness of these documents to transfer patent rights.

The district court concluded correctly that Ajinomoto's standing to sue for infringement of the '765 patent had been established. This ruling is affirmed.

VALIDITY

Signatures of the Inventors

ADM argues that the United States patent application was improperly executed, that the flaws are irremediable, and that this invalidates the '765 patent.

The Russian application for Inventors' Certificate named fourteen inventors. ADM does not challenge that this application was personally signed by each of the fourteen inventors. One of the inventors, Dr. Kozlov, stated in his deposition testimony that he had not personally signed the corresponding United States application, but that his name had been signed in his absence with his authorization. ADM argued that this invalidated the United States patent, and could not be remedied by subsequent ratification. In addition, in 1980 Genetika filed a declaration in the PTO stating that strains of the bacteria had been deposited in Genetika's culture depository and that the deposits would be available to the public; ADM charges that not all fourteen inventors personally signed this declaration, and that this too invalidated the patent and could not be remedied.

These issues were raised during the litigation, and on August 5, 1996 Ajinomoto filed a declaration with the PTO, the Russian language version of which was signed by the

fourteen inventors, stating that the filings wherein the signatures of some inventors were entered by others with the inventors' authorization "was the result of a lack of knowledge of the technical requirements of U.S. patent law and was made without any deceptive intent." ADM's handwriting expert compared the fourteen signatures on the 1996 declaration with the fourteen signatures on the declaration filed in 1980 and gave the opinion that six or possibly seven of the signatures were not written by the same person. ADM's expert conceded that the signatures were difficult to compare since those on the 1996 Russian document were written in the Russian (cyrillic) script, whereas those on the 1980 English document were written in English script. ADM complains that it was able to depose only Dr. Kozlov and Dr. Debabov, and states that Ajinomoto should have provided objective authentication of all of the signatures and should have produced the fourteen inventors at the trial.

The district court, receiving the evidence and hearing the argument, ruled that invalidity based on the signing procedures required a showing of clear and convincing evidence of fraud or inequitable conduct by the inventors. ADM argues that the Russian inventors had deceptive intent when they filed the United States patent application and the 1980 declaration. The district court found that there was not evidence to support this position. The court ruled that technical errors, made without deceptive intent, could not be the basis for holding the patent invalid or unenforceable, citing *In re Bennett*, 766 F.2d 524, 526-28, 226 USPQ 413, 415 (Fed. Cir. 1985) ("It is not in the public interest to bar all possibility of legal or equitable relief, when such is sought to correct a harmless error. Thus we consider the reality of the practice at issue, guided by legislative and judicial precedent, and mindful of the interest of justice.")

On appeal, ADM argues that the district court erred in requiring evidence of fraud or deceptive intent, and that the

irregularities of signature rendered the patent invalid as a matter of law, and were incurable by any subsequent ratification. ADM cites *Kennedy v. Hazelton*, 128 U.S. 667 (1888) and similar cases for the argument that the inventor must personally sign the oath or the patent is invalid. The cited authority is inapt. In *Kennedy v. Hazelton* the inventor had attempted to evade a contractual obligation to assign improvements by causing a third person to apply for the patent in the third person's name. The Court held the patent invalid because it was applied for by a person who did not make the invention: "A patent which is not supported by the oath of the inventor, but applied for by one who is not the inventor, is unauthorized by law and void . . . ." *Id.* at 672.

The district court distinguished such fraudulent filings from a filing in which the inventors authorized others to sign the documents in ignorance of United States requirements, and for which remedial action was taken by the inventors. The law does not bar the correction of defects when the defect was not the product of fraud. The district court did not err in requiring proof of fraud or inequitable conduct in order to preclude corrective action.

ADM also argues that the district court misplaced the burden of proof, that the burden was on Ajinomoto to prove the absence of deceptive intent in the signatures on the filings in 1979 and 1980, and that the 1996 declaration of the Russian inventors did not meet this burden with respect to events so many years earlier. However, the burden of proving that a patent is invalid is upon the party who asserts the defense. ADM also argues that it met the burden of proving deceptive intent, if it bore that burden, because Ajinomoto's explanation of the defective signatures was inadequate.

The district court found that ADM did not present evidence sufficient to establish the facts of material misrepresentation and deceptive intent, predicate to its assertion of fraud or inequitable conduct. *See Kingsdown Medical Consultants,*

Ltd. v. Hollister Inc., 863 F.2d 867, 872, 9 USPQ2d 1384, 1389 (Fed. Cir. 1988) (*en banc*) ("Inequitable conduct resides in failure to disclose material information, or submission of false material information, with an intent to deceive, and those two elements, materiality and intent, must be proven by clear and convincing evidence."); *FMC Corp. v. Manitowoc Co.*, 835 F.2d 1411, 1417 n.11, 5 USPQ2d 1112, 1117 n.11 (Fed. Cir. 1987) (confirming that "a determination of 'inequitable conduct' may not be based on inferences").

Clear error has not been shown in the district court's findings on this issue. The court's ruling is affirmed.

Enablement

ADM argues that claims 1 and 2 of the '765 patent are not enabled as required by 35 U.S.C. §112. ADM states that the '765 patent does not adequately teach how to identify the specific amino acid genes in the donor bacterium, how to obtain a chromosome DNA fragment, how to obtain suitable plasmids, how to isolate recipient bacterial strains, and how to perform the transformation step.

Enablement is determined from the viewpoint of persons of skill in the field of the invention at the time the patent application was filed. Experts for both sides testified as to all of the challenged aspects and as to the level of skill at the time. The district court, summarizing the evidence, found that the specification of the '765 patent enabled the scope of the claims. Responding to ADM's argument that the claims could cover myriad bacterial strains not yet known, the court stated:

> According to the record, all of the methods needed to practice the invention were well known to those skilled in the art. Despite the diversity existing among bacteria, practitioners of this art were prepared to carry out the identification, isolation, recombination, and transforma-

> tion steps required to practice the full scope of the claims.

Ajinomoto, 1998 WL 151411 at *44. *See Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir. 1986) ("a patent need not teach, and preferably omits, what is well known in the art.") On appeal ADM reargues this issue.

The district court heard extensive testimony from qualified experts, with exploration of the technology in light of the knowledge and publications at the time the patent application was filed. The court also pointed to the extensive exploration of enablement during examination in the PTO, when Ajinomoto had challenged this aspect of Genetika's patent before acquiring it:

> Prior to becoming the assignee of the '765 patent, Ajinomoto argued, during the prosecution of seven patent applications, that the specification of the '765 patent did not enable the full scope of the claims. However, in each instance, the PTO Examiner rejected Ajinomoto's argument, finding that the patent was enabled since the types of mutations suggested by the patent were conventional and one skilled in the art could easily produce such mutants because genetic engineering techniques were conventional and well-known.

Ajinomoto, 1998 WL 151411 at 14-15 (Finding of Fact 57). The district court found, as had the examiner, that the process used conventional and well-known genetic engineering techniques. ADM has not shown clear error in the district court's findings and in the conclusion that invalidity on the ground of enablement has not been shown.

The district court also found that the enablement requirement had been met by deposit of the bacterial products in accordance with 35 U.S.C. §122. The deposit of biological organisms for public availability satisfies the enablement

requirement for materials that are not amenable to written description or that constitute unique biological materials which can not be duplicated. As discussed in *In re Lundak*, 773 F.2d 1216, 1220-21, 227 USPQ 90, 93-94 (Fed. Cir. 1985), "When an invention relates to a new biological material, the material may not be reproducible even when detailed procedures and a complete taxonomic description are included in the specification." It is then a condition of the patent grant that physical samples of such materials be deposited and made available to the public, under procedures established by the PTO and by international treaty. *Id.*

The applicant deposited the four strains specifically described in the '765 patent for producing threonine: the donor strain MG442, the recipient strain VL334, and the products of claims 3 and 4, VL334 (pYN6) and VL334 (pYN7). ADM argues that the deposit did not establish enablement because requests for samples of the deposited microorganisms, by Degussa, a German company, and Eurolysine, a French firm, both of which manufacture threonine, were unsuccessful. The district court found that these requests had been properly denied because they did not comply with the procedures established in the Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure. ADM does not dispute this finding, and offers no reason why the requests should have been granted if contrary to the treaty procedures. Error has not been shown in the district court's conclusion that the patent was not invalid on this ground.

Best Mode

ADM also argues that the '765 patent is invalid under 35 U.S.C. §112 for failure to disclose the best mode of making and using the invention. In particular, ADM argues that the inventors did not explicitly state that the recipient bacterial strain was required to contain the relA+ gene in order to

achieve increased threonine production. ADM states that the most relevant scientific literature included two articles published by the inventors in *Genetika*, a Russian scientific publication, four months before their application for the Soviet Inventors' Certificate. ADM argues that the information in these articles should have been included in the patent application if it were to be relied upon for compliance with the best mode requirement.

ADM does not dispute the public availability of the *Genetika* publications, and that they are prior art to the '765 patent. The district court heard extensive expert testimony by both sides on the issue of the relA+ gene and the disclosure of the best mode:

> According to Dr. Rudolph [ADM's expert], one of ordinary skill in the art being familiar with the literature, particularly the Debabov article and Genetika I and II, would have been able to determine the best mode of practicing the '765 invention. Dr. Falkinham [Ajinomoto's expert] goes one step further concluding that one of ordinary skill in the art would have known that relA+ is required to practice the claimed invention.

Ajinomoto, 1998 WL 151411 at *20 (Finding of Fact 77). ADM does not charge that this finding is in error, but argues that the relevant scientific knowledge should have been included in the patent document.

The law has long recognized that such a requirement is unnecessary and inappropriate. *See In re Storrs*, 245 F.2d 474, 478, 114 USPQ 293, 296-97 (CCPA 1957) ("[I]t cannot be forgotten that the disclosure is not addressed to the public generally, but to those skilled in the art.") Requiring inclusion in the patent of known scientific/technological information would add an imprecise and open-ended criterion to the content of patent specifications, could greatly enlarge the content of patent specifications and unnecessarily increase the cost of preparing and prosecuting patent applications, and

could tend to obfuscate rather than highlight the contribution to which the patent is directed. A patent is not a scientific treatise, but a document that presumes a readership skilled in the field of the invention. *See W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1556, 220 USPQ 303, 315 (Fed. Cir. 1983) ("Patents, however, are written to enable those skilled in the art to practice the invention, not the public.")

Upon extensive analysis of the evidence, the district court found that the specification described the only and therefore the best mode known at the time the patent application was filed, and would be so recognized by persons skilled in the art:

> The only mode for practicing the invention disclosed in the '765 patent is the description in the specification of the preparation of strains VL334 (pYN6) and VL334 (pYN7). These strains were the only reductions to practice contemplated by the inventors at the time of the filing of the application. Although the specification does not expressly characterize the recipient strain VL334 as being relA+, it is undisputed that the parent strain of VL334, MG422, is relA+; thus, absent any indication of change to the relA gene, one skilled in the art would know that VL334 was also relA+.

Ajinomoto, 1998 WL 151411 at *42 (Finding of Law 36). No challenge is raised by ADM to the scientific premises and conclusions reached by the district court. The court's ruling based thereon, that the '765 patent has not been shown to be invalid on best mode grounds, is affirmed.

INFRINGEMENT

35 U.S.C. §271(g) imposes liability for infringement by importation, sale, or use in the United States of a product made abroad by a process patented in the United States:

> §271(g) Whoever without authority imports into the United States or offers to sell, sells, or uses within the United States a product which is made by a process patented in the United States shall be liable as an infringer, if the importation, offer to sell, sale, or use of the product occurs during the term of such process patent. . . . A product which is made by a patented process will, for purposes of this title, not be considered to be so made after—(1) it is materially changed by subsequent processes; or (2) it becomes a trivial and nonessential component of another product.

Section 271(g) was enacted in 1988. Previously, the holder of a United States process patent had no recourse against one who practiced the process abroad and imported the product. The purpose of §271(g) was to close this loophole and bring United States law into conformity with that of other nations. Thus §271(g) imposes liability for infringement of the United States patent, with certain safeguards as set forth in the statute.

ADM's principal defenses were that the importation and use were authorized, and that the imported bacteria did not infringe correctly construed claims. Ajinomoto bore the burden of establishing that the imported strains were manufactured by a process covered by the '765 patent, and ADM bore the burden of establishing its defense that it had "authority" to perform the challenged actions. The district court found that bacterial strains G472T23 (pYN8), G472T23 (pYNSTOP), and G472T23 (pYNTE2) were made by the process claimed in the '765 patent, and that their importation and use infringed claims 1 and 2 of the '765 patent.

Importation "Without Authority" Under §271(g)

ADM argues that "without authority" in §271(g) means whether the patented process was authorized for practice abroad, and that §271(g) does not prohibit importation into

the United States of goods produced abroad with authority. ADM argues that practice of the accused process abroad and importation of the product into the United States were authorized because the Soviet agency Licensintorg in 1986 granted a license to the Genetika technology and the bacterial strain G472T23 (pYN7) to A.C. Biotechnics, a Swedish company that is predecessor to ABP International, the producer of the bacteria sold to ADM.

The license to A.C. Biotechnics granted "the exclusive right to use the licensed strain, knowledge and patents for the purpose of manufacturing of L-threonine in the territory [Belgium, Denmark, Finland, FRG, Holland, Iceland, Luxemburg, Norway, and Sweden] and the non-exclusive right to use and sell L-threonine, thus produced, in the territory and the zone of non-exclusive right [worldwide except the U.S.A. and Japan]." ADM argues that this license of the Genetika invention would be meaningless if it did not confer the right to import the bacterial strains into the United States. ADM points out that a United States patent does not prohibit the practice abroad of an invention patented in the United States.

Ajinomoto responds that §271(g) is not concerned with ABP's practice abroad, but applies only when there is imported into the United States a product that would infringe the United States patent if it were made in the United States. *See Biotechnology Gen'l Corp. v. Genentech, Inc.*, 80 F.3d 1553, 1560, 38 USPQ2d 1321, 1326 (Fed. Cir. 1996). Ajinomoto points out that the license from Genetika explicitly excluded the United States, further negating ADM's argument of "authority." The district court held it irrelevant that Genetika, upon learning of ABP's violation of these territorial limitations, did not act against ABP; we agree that Genetika's inaction did not enlarge ABP's license or diminish that of Ajinomoto. The district court correctly held that

ABP's license did not provide authority to use and sell in the United States.

Section 271(g) by its terms applies to unauthorized actions within the United States; it is irrelevant that the product was authorized to be produced outside of the United States. When the process used abroad is the same as the process covered by a United States patent, liability for infringement arises only upon importation, sale or offers, or use in the United States as set forth in §271(g). ADM admitted at trial that it was aware of the Genetika '765 patent and that ABP's strains were derived from the Genetika strains. The district court found that the process by which ABP made the bacteria was patented in the United States, and that the sale and importation of those bacteria into the United States incurred liability under §271(g). ADM's argument that its actions were not "without authority" must fail.

Claim Construction—"Chromosome DNA Fragment of a Donor Bacterium"

ADM challenges the district court's construction of the term "chromosome DNA fragment of a donor bacterium." ADM does not dispute that, under the district court's construction, the findings of infringement by the strains produced by ABP for ADM are supported. ADM argues, however, that the court erred in its claim construction.

The strains acquired by ADM from ABP were G472T23 (pYN8) and G472T23 (PKYN1108:6), both of which had been developed from the bacteria made by Genetika and provided to ABP. ADM states that ABP improved on the Genetika strain through spontaneously occurring mutations and by making a new hybrid plasmid. Also, ADM asked ABP to remove from pYN8 the portion of DNA that provided resistance to ampicillin, leaving the organism resistant to tetracycline only; the portion of the DNA that produced threonine was unchanged. In response to ADM's request

ABP constructed two additional plasmids, which produced the bacterial strains G472T23 (pYNSTOP) and G472T23 (pYNTE2). The district court found that these bacteria differ only in their resistance to antibiotics.

ADM argues that the hybrid plasmid that ABP combined with a plasmid molecule is not a "chromosome DNA fragment of a donor bacterium" as used in the claim, stressing the importance of "a donor bacterium." ADM states that the DNA fragment that ABP used was itself derived from a hybrid plasmid, not from a donor bacterium. Thus ADM argues that this DNA fragment does not qualify as a fragment of "a donor bacterium," and that the resultant bacterial strains are not within the scope of correctly construed claims.

The district court examined the statements of the experts for both sides on the meaning of "DNA fragment of a donor bacterium" to those skilled in this field of science. The court referred to the usage by ADM of this term, referring to ADM's submission to the Japanese Ministry of Agriculture, Forestry and Fisheries wherein ADM described the threonine operon as "*E. Coli* chromosome fragments," and the usage of this term by ABP in its Owners Manual for the ADM strains. The court described the construction of the strain G472T23 (pYN8) as follows:

> ABP constructed the strain G472T23 (pYN8) from G472T23 (pYN7), which it received from Genetika. ABP used the plasmid pYN7, which had an incomplete (i.e., defective) tetracycline resistant gene, from strain G472T23 in constructing the plasmid pYN8. According to expert testimony and the "owner's manual," ABP isolated the plasmid pYN7 and cut it using restriction endonucleases so as to isolate the chromosomal DNA fragment containing the threonine operon.

Ajinomoto, 1998 WL 151411 at *23. The court concluded that "the chromosome DNA fragment can be identified in the hybrid plasmid and, therefore, should be categorized as such."

There was extensive expert testimony on all of the issues and arguments raised by ADM. We discern no error in the district court's finding that the fact that a DNA fragment was subsequently inserted into a plasmid does not change its origin in a donor bacterium. The district court's claim construction and related conclusions are supported by the testimony of the experts and fully accord with ADM's and ABP's own usages, and are affirmed. Applying the district court's claim construction, the imported hybrid plasmid contains the chromosome DNA fragment of a donor bacterium, and is in infringement of claims 1 and 2. The finding of infringement is affirmed.

Damages

The trial ended on November 13, 1996. The district court entered its judgment and damages award on March 13, 1998, assessing a royalty of $1.23/kg of threonine sold by ADM after May 1993. ADM does not dispute the royalty rate of $1.23/kg, but disputes its assessment to most of the production after November 1996, ADM stating that the day after testimony closed it switched to a different bacterial "culture 4," and had returned to the previous "culture 3" for only a brief period in 1997. On March 27, 1998 ADM moved to amend the judgment on the ground that there was "no evidentiary basis" for the court's award of damages for most of the production after the trial ended.

Responding to the motion to amend, the district court observed that although ADM now stated that it discontinued use of the infringing strain G472T23 (pYNTE2) on the last day of testimony and switched to a different strain the following day, ADM did not inform the court that it had done so, or that it intended to do so, until after judgment was rendered. The court observed that Steven Stoddard, ADM's group leader of amino acid fermentation, testified as the final witness that the G472T23 (pYNTE2) strain was being "used

today" in ADM's commercial production of threonine, and gave no hint that a change was planned for the next day. The court commented on the "fine distinctions" in that testimony, and observed that only ADM "was privy" to the correct information and that ADM "chose not to correct the record it created at trial" until after judgment. The district court denied the motion.

ADM states that it was entitled to a hearing on whether its changed bacteria were infringing. Ajinomoto responds by pointing out that ADM had denied discovery of such changes, had dissembled and avoided including culture 4 in the trial, and that the district court acted within its discretion, on these facts, in declining to accept this tardy assertion of non-infringement for production before judgment. Ajinomoto also disputes ADM's assertion that culture 4 is non-infringing.

We review a court's denial of a motion to amend the judgment for abuse of discretion. *United States v. Anthony Dell'Aquilla*, 150 F.3d 329, 338 n.8 (3d Cir. 1998) ("Our standard of review for the district court's denial of the appellants' motion to alter or amend a judgment under Fed. R. Civ. P. 59(e) is for an abuse of discretion because the underlying order was an assessment of monetary penalties."); *Donivan v. Dallastown Borough*, 835 F.2d 486, 487 (3d Cir. 1987) ("When a district court rejects a motion to alter or amend a judgment, our standard of review is whether the district court abused its discretion.") Review is plenary, however, if the district court based its decision on an error of law. *Bushman v. Halm*, 798 F.2d 651, 656 n.9 (3d Cir. 1986) ("In general, the appropriate standard of review for a motion to reconsider is whether there has been an abuse of discretion. However, to the extent the decision to deny a Rule 59 motion is based upon the interpretation and application of a legal precept, our review is plenary.")

The Supreme Court has explained Rule 59(e) as follows:

> Rule 59(e) was added to the Federal Rules of Civil Procedure in 1946. Its draftsmen had a clear and narrow aim. According to the accompanying Advisory Committee Report, the Rule was adopted to "mak[e] clear that the district court possesses the power" to rectify its own mistakes in the period immediately following the entry of judgment.

White v. New Hampshire Dept. of Employment Security, 455 U.S. 445 (1982).

Rule 59(e) is not a vehicle for reopening judgments to present information that was long possessed by the movant and that was directly relevant to the litigation. The Third Circuit, whose law governs this district court in procedural matters not within the Federal Circuit's exclusive jurisdiction, has instructed that:

> A proper motion to alter or amend judgment "must rely on one of three major grounds: '(1) an intervening change in controlling law; (2) the availability of new evidence [not available previously]; [or] (3) the need to correct clear error [of law] or prevent manifest injustice.'"

North River Ins. Co. v. CIGNA Reins. Co., 52 F.3d 1194, 1218 (3d Cir. 1995) (quoting *Natural Resources Defense Council v. United States Envtl. Protection Agency*, 705 F. Supp. 698, 702 (D.D.C.1989)).

Applying these grounds, there was clearly no intervening change of law. As to the second ground, the evidence that ADM had changed to an assertedly non-infringing culture for producing threonine was neither new nor unavailable to ADM before entry of judgment. Indeed, only ADM had this information. *See, e.g., Buell v. Security General Life Ins. Co.*, 987 F.2d 1467, 1472 (10th Cir. 1993) ("When supplementing a Rule 59(e) motion with additional evidence, the movant

must show either that the evidence is newly discovered [and] if the evidence was available at the time of the decision being challenged, that counsel made a diligent yet unsuccessful effort to discover the evidence.")

It was ADM's decision not to provide information about this change in its defense of non-infringement until after judgment was rendered, and indeed to provide explicit testimony that it was using the infringing strain. ADM offered no explanation of its silence, and simply argued that there was no evidence that ADM was using the ABP strains to produce threonine "at the present time," apparently referring to the time of the motion to amend. However, the evidence before the court at the time the judgment was rendered fully supported the court's assessment of damages. ADM, in its pre-trial admissions, acknowledged it was using the ABP strains and identified the specific strain used. And in a joint pre-trial statement of stipulated facts, ADM stated that it had not used any strains other than those it obtained from ABP. ADM offered no correction of these admissions before the court's judgment. *See* Fed. R. Civ. P. 36(b) ("Any matter admitted under this rule is conclusively established unless the court on motion permits withdrawal or amendment of the admission.")

ADM had requested, and been granted, a protective order prohibiting Ajinomoto from taking discovery about ADM's current research on the production of threonine. In its opposition to the protective order, Ajinomoto stated its belief that the bacterial strains ADM was developing would also infringe the '765 patent, and stated that "[p]reventing Ajinomoto from gaining access to ADM's 'new' strains now will only create the possible necessity for another law suit in the future—a waste of both judicial resources and the resources of the parties." Ajinomoto argues that by avoiding discovery, the misleading testimony of ADM's final witness, and the complete silence as to this new defense of

non-infringement based on different bacteria, ADM waived or lost any right to relief from judgment and to relitigation of the question of infringement (as ADM requested in its motion to amend).

ADM, of course, had the right to change its process to one it considered non-infringing. Had it informed the court of this defense during the lengthy pendency of the action, or had the other events to which the district court referred not occurred, the district court might have exercised its discretion differently. However, the district court has broad discretion in deciding whether to re-open a case, after the entry of judgment, to permit another infringement trial of issues that could have been resolved concurrently, with the benefit of the expertise and effort of the first trial. Abuse of discretion, on the facts hereof, has not been shown.

The Assessment of Damages

The district court assessed royalties for the period up to the filing of ADM's motion on March 27, 1998. We conclude that the district court erred in including, in the measure of damages, product produced during the period between entry of final judgment and the filing of the motion to amend. Although we do not disturb the district court's assessment of damages for the period before entry of judgment, for the period after entry of judgment ADM is entitled to raise the defense of non-infringement. The district court recognized this principle, in declining to assess damages for sales after March 27, 1998, the date ADM raised the issue of non-infringement based on process changes. Although the record and the purposes of Rule 59(e) support the district court's discretion in declining to relitigate pre-judgment infringement, ADM's post-judgment motion reasonably placed at issue ADM's infringement after judgment. Thus liability for infringement after the date of judgment requires further proceedings, during which ADM may raise the defense of non-infringement for that period.

The court's damages award is modified to the extent that production after March 13, 1998 shall not be included in the royalty obligation herein assessed.

Enhancement of Damages—the Cross Appeal

Ajinomoto cross appeals the district court's ruling that ADM's infringement was not willful. Ajinomoto points to ADM's knowledge of the '765 patent at the time it bought the infringing strains from ABP for use in the United States, ADM's knowledge of Ajinomoto's exclusive rights under the United States patent, the explicit exclusion of United States rights in the Biotechnics license from Genetika, and ADM's assertion that it obtained no opinion of counsel before embarking upon its infringing activities. Ajinomoto argues that the district court clearly erred in failing to find that this was an exceptional case and in declining to enhance damages.

The district court concluded that the record as a whole did not support a finding of willfulness. The court referred to the representations made to ADM by ABP and Genetika's subsequent failure to enforce the condition in the Biotechnics license, and declined to impute bad faith to ADM's dealings with ABP. The district court observed that ADM mounted a substantial, albeit unsuccessful, challenge on the issues of validity and infringement. We do not discern clear error in the district court's finding on the issue of willful infringement.

No costs.

AFFIRMED; DAMAGES MODIFIED

APPENDIX B

(Federal Circuit Order Denying Rehearing)

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

[Filed Nov. 14, 2000]

99-1098, -1099, -1209, -1210

AJINOMOTO CO., INC.,
Plaintiff-Cross Appellant,

v.

ARCHER-DANIELS-MIDLAND CO.,
Defendant-Appellant.

ORDER

A combined petition for panel rehearing and rehearing en banc having been filed by the APPELLANT, and the petition for rehearing having been referred to the panel that heard the appeal, and thereafter the petition for rehearing en banc having been referred to the circuit judges who are in regular active service,

UPON CONSIDERATION THEREOF, it is

ORDERED that the petition for panel rehearing be, and the same hereby is, DENIED and it is further

ORDERED that the petition for rehearing en banc be, and the same hereby is, DENIED.

The mandate of the court will issue on November 21, 2000.

FOR THE COURT,

/s/ Jan Horbaly
Jan Horbaly
Clerk

Dated: November 14, 2000

cc: Charles A. Laff
Arthur I. Neustadt

Note: Pursuant to Fed. Cir. R. 47.6, this order is not citable as precedent. It is a public record.

APPENDIX C

(District Court Order and Opinion on Liability)

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

C.A. No. 95-218-SLR

AJINOMOTO CO., INC.,

Plaintiff,

v.

ARCHER-DANIELS-MIDLAND CO.,

Defendant.

ORDER

At Wilmington this 13th day of March, 1998, for the reasons stated in the court's opinion issued this date;

IT IS ORDERED that judgment is entered in favor of plaintiff Ajinomoto Co., Inc. and against defendant Archer-Daniels-Midland Co. on the court's finding of infringement and validity of United States Patent No. 4,278,765.

IT IS FURTHER ORDERED that plaintiff shall submit to the court, on or before April 13, 1998, a further order addressing the issues of damages and injunctive relief. Defendant may respond to said proposed order on or before April 27, 1998.

/s/ Sue L. Robinson
United States District Judge

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

C.A. No. 95-218-SLR

AJINOMOTO CO., INC.,

Plaintiff,

v.

ARCHER-DANIELS-MIDLAND CO.,

Defendant.

March 13, 1998
Wilmington, Delaware

OPINION

ROBINSON, District Judge

I. INTRODUCTION

Plaintiff Ajinomoto Co., Inc. ("Ajinomoto") filed this suit pursuant to 35 U.S.C. § 271(g) against defendant Archer-Daniels-Midland Co. ("ADM") on April 6, 1995 seeking damages (lost royalty income) and an injunction against defendant Archer-Daniels-Midiand ("ADM") for alleged infringement of a patent that is directed to a method for the preparation of bacterial strains possessing enhanced capability of producing amino acids.

Specifically, Ajinomoto charges that ADM willfully infringed claims 1 and 2 of U.S. Patent No. 4,278,765 ("the '765 patent") entitled "Method for Preparing Bacterial Strains Which Produce Amino Acids" issued on July 14, 1981. The priority patent to this patent was filed in the former Soviet Union on June 30, 1978.

Defendant denies infringement and challenges the validity and enforceability of the '765 patent under 35 U.S.C. §§ 112 ("obviousness"), 103 ("best mode" and "enablement"), and

115 and 116 ("oath of applicant"). Specifically, ADM charges that: (1) the specification of the '765 patent: (a) does not disclose the best mode contemplated by the inventors of carrying out their invention, (b) fails to enable the full scope of generic claims 1 and 2 without undue experimentation, and (c) lacks the deposit of the biological materials in a depository that will distribute samples of the material to members of the public who wish to practice the invention after the patent issues (§ 112); (2) the differences between the patented invention and the prior art are such that claims 1 and 2 would have been obvious to one of ordinary skill in the pertinent art (§ 103); and (3) not all of the inventors personally signed the declarations required to grant the '765 patent (§§ 115, 116). Additionally, ADM contends that Ajinomoto lacks standing to sue ADM for infringement of the '765 patent because the chain of title of the '765 patent from the named inventors to Ajinomoto was not established. Moreover, ADM affirmatively defends that the '765 patent is invalid because the patent applicants conducted themselves inequitably in their prosecution of the patent application by withholding and concealing prior art and by concealing the best mode of carrying out the invention.

The court has jurisdiction over this matter pursuant to 28 U.S.C. § 1338(a).

The parties tried this matter to the court from October 28, 1996 through November 11, 1996. The following constitutes the court's findings of fact and conclusions of law pursuant to Fed. R. Civ. P. 52(a).

II. FINDINGS OF FACT

A. The Invention

1. **Amino Acids.** The '765 patent is directed to a method for the construction of genetically engineered bacterial strains possessing an enhanced capability of producing selected

amino acids, such as threonine, without the need for additional growth factors. (Joint Exhibit ("JX") 1 at col. 3, lines 1-4) Amino acids are the building blocks of proteins. Proteins are complex macromolecules composed of long chains of amino acids that carry out structural and/or catalytic functions in cells. (D.I. 307 at 97-99) There are twenty amino acids: alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine, tryptophan, glycine, asparagine, glutamine, cysteine, serine, threonine, tyrosine, aspartic acid, glutamic acid, lysine, arginine, and histidine.

2. The '765 patent specifically discloses a method for producing an *Escherichia coli* ("*E.coli*") bacteria capable of overproducing the amino acid threonine. (JX 1) Threonine is of great industrial importance. It is an essential amino acid which, because it cannot be produced by any animal, must be supplied through dietary supplements. ADM's animal feed supplements supply various essential amino acids, including threonine.

3. A bacterial strain is a type or variety of a particular species of bacteria. There are thousands of known species of bacteria, as well as many bacterial strains within each species. All bacteria naturally make amino acid. Bacterial strains prepared in accordance with the patented technology can reduce the cost of producing amino acids, which are used, *inter alia*, as feedstuff and food additives in the agriculture and food industry. (JX 1 at col. 1, lines 8-12)

4. **Threonine Biosynthesis.** Threonine synthesis in a cell is a five step process. (Docket Item ("D.I.") 308 at 322-24; D.I. 313 at 941; Defendant's Exhibit ("DX") 298 at 346; DX 1005) In step 1, aspartate is converted into aspartyl phosphate. (D.I. 313 at 940-43; DX 298 at 346; DX 1005) Step 2 involves the conversion of aspartyl phosphate into aspartate semialdehyde. (D.I. 313 at 940-43; DX 298 at 346; DX 1005) The third step involves the conversion of aspartate semialdehyde into homoserine. (D.I. 313 at 940-43; DX 298

at 346; DX 1005) In step 4, homoserine is converted into O-phospho homoserine. (D.I. 313 at 940-43; DX 298 at 346; DX 1005) And finally, in step 5, O-phospho homoserine is converted into threonine. (D.I. 313 at 940-43; DX 298 at 346; DX 1005) Subsequently, some of the threonine is converted into isoleucine; the product of the *ilvA* gene catalyzes the first step in this transformation. (D.I. 313 at 940-43; DX 298 at 346; DX 1005) Through separate pathways, the process also results in the synthesis of lysine and methionine from the threonine precursors aspartate semialdehyde and homoserine, respectively. (D.I. 313 at 940-43; DX 298 at 346; DX 1005)

5. In *E. coli*[1] the entire process is catalyzed by a variety of enzymes,[2] three of which are coded by the threonine operon.[3] (D.I. 307 at 105-06; D.I. 313 at 947; DX 298 at 346; DX 1005) The threonine operon contains three structural genes: *thrA*, *thrB*, and *thrC*. (D.I. 307 at 105-06; D.I. 313 at 947;

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[1] The biosynthetic pathway for the production of threonine is not the same in all bacterial species. (D.I. 307 at 944-946) For example, with respect to *Corynebacteria*, although the basic steps in the pathway are the same, the number of isoenzymes involved in the various steps varies as does the method of regulation. (D.I. 313 at 944-46) In addition, in *Corynebacteria* although the *thrA* and *asd* genes are together on one part of the bacterial chromosome, the *thrB* and *thrC* are on two separate pieces of DNA. (D.I. 313 at 944-46)

[2] The first step is catalyzed by three isoenzymes, the second by one, the third by two, the fourth by one, and the fifth by one. (D.I. 313 at 941) An isoenzyme (or isozyme) is one of a group of enzymes that are very similar in catalytic properties, but can be distinguished based on variations in physical properties.

[3] The term operon is defined as "[a] unit of genetic expression consisting of one or more related genes and the operator and promotor sequences that regulate their transcription." Albert L. Lehninger, *Principles of Biochemistry* 977 (Sally Anderson & June Fox eds., 1982). In the '765 patent, the term operon is defined as "a jointly controlled group of genes generally monitoring the synthesis of a single product, e.g. aminoacid." (JX 1 at col. 1, lines 49-51)

DX 298 at 346; DX 1005) The *thrA* gene codes for a bifunctional enzyme--aspartokinase for $thrA_1$ and homoserine dehydrogenase for $thrA_2$—which catalyze steps 1 and 3, respectively. (D.I. 307 at 105-06; D.I. 313 at 940-43; DX 298 at 346; DX 1005 The two remaining genes, *thrB* and *thrC*, code for homoserine kinase (step 4) and threonine synthetase (step 5), respectively. (D.I. 307 at 105-06; D.I. 313 at 940-43; DX 298 at 346; DX 1005)

6. The product of the *asd* gene,[4] which is located outside of the threonine operon (approximately 1500 genes away), catalyzes the conversion of aspartyl phosphate into the semialdehyde of aspartic acid (the second step in threonine synthesis). (D.I. 313 at 947) This is not a limiting step in the biosynthetic process.

7. In *E. coli*, regulation of the threonine operon is accomplished by means of a multivariant repression mechanism (negative feedback regulation), so that when a large amount of a particular product is formed, it blocks its own synthesis. (D.I. 313 at 942) With respect to the first step of threonine synthesis, lysine inhibits one of the isozymes, methionine inhibits a second isozyme, and isoleucine and threonine inhibit the third isozyme. (D.I. 313 at 940-43; DX 298 at 346; DX 1005) Lysine and methionine also regulate their own synthesis. (D.I. 313 at 940-43; DX 298 at 346; DX 1005) In addition, threonine and isoleucine inhibit one of the isozymes involved in step 3. (D.I. 313 at 940-43; DX 298 at 346; DX 1005) Besides the feedback inhibition effect that changes the activity of the level of the available enzyme, isoleucine and threonine also affect the level of available enzyme—as the levels of isoleucine and threonine increase, the amount of enzyme decreases. (D.I. 313 at 940-43)

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[4] Although Ajinomoto asserts that testimony regarding the role of the *asd* gene in the biosynthesis of threonine should be discarded because of insufficient notice, the issue was raised by Ajinomoto's expert witness, Dr. Joseph O. Falkinham III, on cross-examination when he was questioned regarding threonine synthesis in *E. coli*.

8. **The Technology Developed by the Genetika Researchers.** The method of preparation set forth in the '765 patent was developed by fourteen researchers at the Institute for Genetic Engineering and Industrial Microbiology ("Genetika") in the former Soviet Union. (D.I. 307 at 123-24) In developing the process, the researchers combined skills from both classical genetics and recombinant DNA technology. (D.I. 307 at 126) Although not the first scientists to employ recombinant DNA technology, the Genetika researchers were the first in the former Soviet Union to do so. (DX 1100 at 30-31) Unlike their peers in other countries who were applying recombinant DNA technology[5] to the development of pharmaceuticals, the Genetika researchers applied this technology to the production of enzymes and, as in the case of the '765 patent, amino acids. (D.I. 307 at 124-26)

9. In order to create a bacterial strain capable of overproducing threonine, the Genetika researchers used a strain of *E. coli* that was feedback resistant for the amino acid threonine. (JX 1 at col. 3, lines 30-36) Using recombinant DNA technology,[6] the researchers isolated the threonine operon from the strain and combined this chromosomal

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[5] Herb Boyer and Stanley Cohen of Stanford University and the University of California, San Francisco respectively developed recombinant DNA technology. (D.I. 307 at 111) The technology was first described in a paper in The Proceedings of the National Academy of Sciences in November 1973. (D.I. 307 at 111) As compared to classical genetics, which typically involves exposing microorganisms to mutagens that randomly alter genetic material and then screening for mutants with desired characteristics, recombinant DNA technology involves the making of specific alterations in DNA, generally through the cutting and then ligating of DNA from different sources. (D.I. 307 at 111)

[6] For basic background information about molecular biology and recombinant DNA technology, see *In re O'Farrell*, 853 F.2d 894, 895-99 (Fed. Cir. 1988).

fragment with a plasmid.[7] (JX 1 at col. 3, lines 30-36) This hybrid plasmid was then inserted into a host bacterial strain that was auxotrophic[8] with respect to threonine and contained a partial block ("leaky auxotroph") in the related step of metabolism, the conversion of threonine to isoleucine. (JX 1 at col. 3, lines 46-51) The resultant strain of bacteria was capable of the over production of threonine.

B. The '765 Patent Application

10. **The Russian Patent Application.** On June 30, 1978, fourteen Genetika researchers[9] filed a Russian patent application entitled "Method for Preparing Strains Producing Aminoacids" (application no. 2639616) ("the Russian patent application"). (Plaintiff's Exhibit ("PX") 2) This patent was directed to "a method for preparing strains of microorganisms possessing an increased ability of producing aminoacids [sic] and lack of demands for additional growth factors." (PX 2 at 80) According to Soviet law, the Russian patent application was personally signed by all fourteen inventors. (D.I. 196 at Ex. 5, ¶ 44)

The Russian patent application listed sixteen references, the pertinent contents of which were identified by use of reference numbers throughout the text of the specification. (PX 2 at 98) Of these references, only the following are

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[7] The term plasmid refers to "[a]n extrachromosomal, independently replicating small circular DNA molecule." Albert L. Lehninger, *Principles of Biochemistry* 977 (Sally Anderson & June Fox eds., 1982).

[8] An auxotrophic bacterial strain possesses a mutation that renders it "defective in the synthesis of a given biomolecule, which must thus be supplied for its normal growth." *Principles of Biochemistry* 970 (Sally Anderson & June Fox eds., 1982).

[9] The fourteen inventors were: Vladimir G. Debabov, Jury I. Kozlov, Nelli I. Zhdanova, Evgeny M. Khurges, Nikolai K. Yankovsky, Mikhail N. Rozinov, Rustem S. Shakulov, Boris A. Rebentish, Vitaly A. Livshits, Mikhail M. Gusyatiner, Sergei V. Mashko, Vera N. Moshentseva, Ljudmila F. Kozyreva, and Raisa A. Arsatiants.

relevant to the case at bar: (1) an article authored by several of the named co-inventors of the '765 patent (Gusyatiner, Zhdanova, Livshit[s]; and Shakulov) entitled *Investigation of the function of the relA gene in the expression of amino acid operons: Communication II. Influence of the allelic state of the relA gene on oversynthesis of threonine by a mutant of Escherichia coli K-12 resistant to beta-hydroxynorvaline* appearing in the publication Genetika 14(6) (June 1978) ("Genetika II") and (2) an article entitled *A Suitable Method for Construction and Molecular Cloning Hybrid Plasmids Containing EcoRI-fragments of E. coli Genome* authored by Kozlov et al. (including the named co-inventors Kozlov, Rebentish, and Debabov) published in Molecular and General Genetics in 1977 ("the Kozlov article").

11. **U.S. Patent Application.** The same fourteen inventors who filed the Russian patent application filed the United States counterpart to the Russian patent application on June 28, 1979, two days before the end of the one year priority period.[10] (PX 2) The inventors claimed a priority filing date of June 30, 1978 based upon the Russian application. (PX 2) The following documents were included along with the U.S. patent application: (1) a Russian Language Declaration for Original Patent Application

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[10] Title 35 U.S.C. § 119 provides a right of priority for U.S. patent applications if an application for a patent on the same invention was previously filed in a foreign country. Section 119 provides, in part:

> An application for patent for an invention filed in this country . . . shall have the same effect as the same application would have if filed in this country on the date on which the application for patent . . . was first filed in such foreign country, **if the application in this country is filed within twelve months** from the earliest date on which such foreign application was filed; but **no patent shall be granted on any application for patent for an invention which had been patented . . . in any country more than one year** before the date of the actual filing of the application in this country. . . .

35 U.S.C. § 119 (emphasis added).

("Russian Language Declaration"); (2) the original Russian patent application; and (3) an English translation of the Russian patent application. (PX 2)

12. **The Inventors' Signatures.** The Russian Language Declaration and the Russian patent application contain fourteen signatures purporting to be the signatures of the fourteen original inventors. (PX 2 at 48-53) With respect to the Russian Language Declaration, each signature is followed by a typed date of June 21, 1979. (PX 2 at 48-53) Dr. Juri Ivanovich Kozlov[11] testified that the signature on the Russian Language Declaration is not his own; however, the signor, who he believed to be an employee in Genetika's patent department, "had [his] permission to put [his] signature in [his] absence." (DX 1106 at 144) Dr. Kozlov further testified that he did not remember if he read the declaration or whether it was explained to him before he granted permission for someone to sign it for him. (DX 1106 at 145-46)

13. Dr. Vladimir Georgievich Debabov testified that his signature on the Russian Language Declaration is, in fact, his own. (DX 1100 at 42) Although he does not remember the date on which he signed the declaration, he believed it must have been June 21, 1979 since that is the date on the form. (DX 1100 at 42)

14. **The Prior Art References.** The U.S. patent application omitted the sixteen references found in the Russian patent application. However, unlike the Russian patent application, the U.S. patent application cited six publications which described in detail the method of *in vitro* preparation of hybrid DNA molecules and the introduction of these molecules into a recipient strain by means of transformation or transfection using a plasmid or bacteriophage as a vector. (JX 1 at col. 2, lines 37-44) Of these publications two are

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[11] Only two of the original fourteen inventors were deposed in this litigation. None of the inventors testified at trial.

relevant to the case at bar: (1) an article authored by Clarke and Carbon entitled *Biochemical Construction and Selection of Hybrid Plasmids Containing Specific Segments of the Escherichia coli Genome*, which was published in Proc. Nat'l Acad. Sci. USA, Vol. 72, No. 11 in November 1975 ("the Clarke/Carbon article") and (2) the Kozlov article. (JX 1 at col. 2, lines 52-53, 56-58)

15. At the time the '765 patent application was submitted, applicants were encouraged to file a prior art statement listing therein, "in the opinion of the person filing[,] . . . the closest prior art of which that person is aware." 37 C.F.R. § 1.97(a)-(b) (1978). Said statement was "not to be construed as a representation that a search ha[d] been made or that no better art exist[ed]." 37 C.F.R. § 1.37(b). The statement was to be accompanied by a copy of each listed patent or publication. 37 C.F.R. § 1.98(a). A prior art statement was not submitted as part of the '765 patent application.

According to ADM's expert in Patent and Trademark Office ("PTO") procedure, Mr. Van Horn, at the time of the invention, a PTO Examiner was not likely to review publications that were merely mentioned in the patent application. (D.I. 316 at 1420) Moreover, he testified that unless circumstances arose that necessitated an Examiner to review a priority patent application (e.g., a challenge to the priority date), the content of a priority patent was not reviewed as part of a normal examination of a patent application. (D.I. 316 at 1427-28; DX 268 at 28) If an applicant wanted to be assured that the Examiner considered certain information, he could submit copies of publications or other information to the PTO. (D.I. 316 at 1421) Mr. Van Horn also testified that there were two ways for an Examiner to indicate that a particular reference had been considered: (1) citing the documents in the patent application or (2) placing his initials next to the citation with an indication that

it had been checked. (D.I. 316 at 1423-24) The record indicates that neither method was employed with respect to the '765 patent.

16. The American attorneys who prosecuted the '765 patent did not recall providing the PTO Examiner with copies of Genetika II, the Clarke/Carbon article, or the Kozlov article. (DX 1101 at 44-45; DX 1119 at 28, 32-33) The attorneys testified that their standard procedure with respect to patent applications filed on behalf of Genetika was to check the application for compliance with PTO guidelines and to submit the application basically as is, i.e., without supplementation. (DX 1101 at 40-44; DX 1107 at 28-29, 49-52; DX 1119 at 45-49) It is undisputed that the applicants had knowledge of the existence of the aforementioned articles. It is also undisputed that the Clarke/Carbon article and the Kozlov article are material.

17. **U.S. Patent Prosecution History.** On January 21, 1980, during the prosecution of the '765 patent application, the PTO Examiner rejected claims 1-4 as not enabled under 35 U.S.C. § 112. (PX 2 at 100) In an Office Action dated January 21, 1980, the Examiner cited the following reasons for his rejection of the claims:

> (1) Applicants fail[ed] to comply with requirements (1) and (3) of MPEP 608.01(p) Deposit of Microorganisms[12]

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[12] At the time the application for the '765 patent was pending, § 608.01(p) of the Manual of Patent Examining Procedure ("MPEP") provided as follows:

> Some inventions which are the subject of patent applications depend on the use of microorganisms which must be described in the specification in accordance with 35 U.S.C. 112. No problem exists when the microorganisms used are known and readily available to the public. When the invention depends on the use of a microorganism which is not so known and readily available, applicants must take additional steps to comply with the requirements of Section 112.

> regarding the parent *E. coli* strains and the newly produced *E. coli* strains.[13]
>
> (2) Claims are improper process claims in failing to affirmatively recite steps.
>
> (3) The disclosure is not enabling to support the breadth of the terms "vector DNA molecule." Only plasmids appear to be suitable and operative as the vector.

(PX 2 at 100) The Examiner went on to state that "[t]he listed references [were] considered to be pertinent to the claimed invention, but the claims are deemed patentable thereover."[14]

18. In May 1980, in response to the Examiner's rejection, the one of the applicants' attorneys, Charles Rodman, agreed to "attempt to rectify depository deficiencies" by "furnishing a new declaration containing the required information." (PX 2 at 103, 119) In addition, Mr. Rodman agreed to "amend [the] claims extensively to eliminate [§] 112 rejections." (PX 2 at 103)

In the latter circumstances, the MPEP required applicants to make "a deposit of a culture of the microorganism in a depository affording permanence of the deposit and ready accessibility thereto by the public if a patent is granted. . . ." The section further provided that "all restrictions on the availability to the public of the culture so deposited will be irrevocably removed upon the granting of the patent." (D.I. 64, Ex C)

[13] According to the specification, two of the strains, VL334(pYN6) and VL334(pYN7) having registration numbers CMIM B-1649 and CMIM B-1684, respectively, already were deposited in the Central Museum of Industrial Microorganisms of the All-Union Research Institute of Industrial Microorganisms ("the Central Museum") at the time the application was filed. (PX 2 at 21-22)

[14] Two references were cited on Form PTP-892, Notice of References Cited: Sinsheimer, *Ann. Rev. Biochem* 46, 415-438, 1977 and Itokura et al., *Science* vol. 98, pp. 1056-1063. (PX 2 at 101) A copy of the Sinsheimer reference was included in the file wrapper. (PX 2 at 142-164)

19. On May 21, 1980, Mr. Rodman filed a response to the Office Action requesting reconsideration of the application and entry of numerous amendments, consisting mainly of editorial and typographical corrections in accordance with the PTO action. (PX 2 at 119) He also added the following to the patent application: "The parent strains of VNIIGenetika MG442 and VNIIGenetika VL334 are also deposited in the aforesaid Central Museum and are identified by the registration numbers CMIM B-1641 and CMIM B-1628, respectively." Mr. Rodman stated that he was in the "process of obtaining a Supplementary Declaration from the inventors containing the depository identification of the parent strains and the product strains." He added that he "considered the references cited by the Examiner to show the state of the art, however, inasmuch as these references have not been cited against the claims, and do not appear relevant thereto, a detailed discussion of them shall not appear herein." (PX 2 at 121) A supplemental response to the January 21, 1980 Office Action was filed in August 1980. (PX 2 at 122-24)

20. On August 25, 1980, Mr. Rodman filed the Supplemental Combined Declaration and Power of Attorney ("Supplemental Declaration of 1980") (PX 2 at 125-129) with the PTO, representing under penalty of perjury that,

> no later than the effective U.S. filing date of the application, [they had] made a deposit of a culture of the microorganism in a depository affording permanence of the deposit and ready accessibility thereto by the public if a patent is granted, under conditions which assure (a) that access to the culture will be available during pendency of the patent application to one determined by the Commissioner to be entitled thereto under 37 C.F.R. 1.14 and 35 U.S.C. § 122, and (b) that all restrictions on the availability to the public of the culture so deposited will be irrevocably removed upon the granting of the patent.

This deposit is identified by: Deposit number CMIM B-1628, CMIM B-1641, CMIM B-1649, CMIM B-1684.

Name and address of the depository: Central Museum of Industrial Microorganisms of the All-Union Research Institute of Genetics and Selection of Industrial Microorganisms, USSR, Moscow 113545, Dorozhnaya S.

Taxonomic description (if available): Escherichia coli K-12.

(PX 2 at 126) The donor strain (MG442) was registered as CMIM B-1628; the recipient strain (VL334) was registered as CMIM B-1641; the product of claim 3 (VL334(pYN6)) was registered as CMIM B-1649; and the product of claim 4 (VL334(pYN7)) was registered as CMIM B-1684. (PX 2 at 126) The filing of the Supplemental Declaration of 1980 overcame the Examiner's § 112 rejection of the claims by representing that the strains had been deposited.

21. **The Inventors' Signatures.** The Supplemental Declaration of 1980 contains fourteen signatures, all dated July 17, 1980, that purport to be the signatures of the fourteen original inventors. (PX 2 at 127-29) However, Dr. Kozlov testified that the Kozlov signature is not his own, and that he was unaware of who signed. (DX 1106 at 146-47) Nevertheless, Kozlov testified that he knew of and authorized the signing of his name to the Supplemental Declaration of 1980 but that he was unsure of the date of the signing. (DX 1106 at 146-47) The Kozlov signature on the Supplemental Declaration is consistent in appearance with the Kozlov signature on the Russian Language Declaration. (D.I. 314 at 1256, 1258-59; DX 149; DX 390; DX 1106 at 1104) Dr. Kozlov further testified that he did not remember if he read the Supplemental Declaration of 1980 or if it was explained to him before he authorized someone to sign for him. (DX 1106 at 145-46)

Dr. Debabov testified that he personally signed the Supplemental Declaration of 1980 but that someone else

wrote the date next to his signature. (DX 1100 at 44-45) Dr. Debabov further testified that he did not read the Supplemental Declaration of 1980 because it was explained to him by someone in the patent department. (DX 1100 at 115-17)

22. The PTO Examiner subsequently issued a Notice of Allowance (PX 2 at 133) and the '765 patent issued on July 14, 1981.

23. In order to rectify the signature discrepancies, on August 5, 1996, Ajinomoto filed with the PTO a Supplemental Declaration ("Supplemental Declaration of 1996") that contains the true signatures, according to counsel for Genetika, Mr. Mtibelishvili, of the fourteen inventors along with a petition to the Commissioner of Patents and Trademarks pursuant to 37 C.F.R. §§ 1.67 and 1.182 requesting that the PTO place the Supplemental Declaration of 1996 in the file wrapper. (PX 900) Ajinomoto claimed that the filing containing the authorized signatures "was the result of a lack of knowledge of the technical requirements of U.S. patent law and was made without any deceptive intent." (PX 900)

24. ADM's expert witness, Mr. Lyndal L. Shaneyfelt, a retired FBI document examiner, compared the fourteen signatures on the Russian Language Declaration to the fourteen signatures on the Supplemental Declaration of 1980 and found that six (and possibly seven) of the signatures were not written by the same person. (D.I. 314 at 1247) However, Mr. Shaneyfelt conceded that the signatures were difficult to compare since those on the Russian Language Declaration were written using the Russian alphabet, whereas those on the Supplemental Declaration of 1980 were written using the Arabic alphabet. (D.I. 314 at 1246) Mr. Shaneyfelt also testified that a comparison of the English signatures on the Supplemental Declaration of 1980 revealed numerous significant writing features in common. (D.I. 314 at 1248-50)

He concluded that the at least three, and possibly five, of the signatures were written by the person who made the Debabov signature. (D.I. 314 at 1252) However, he found the examination problematic because there were not "a lot of the same letters." (D.I. 314 at 1251)

Mr. Shaneyfelt also testified that the Kozlov signature on the Russian Language Declaration (DX 390) was "generally consistent" with the exemplar (DX 149) that was done at Dr. Kozlov's deposition in the summer of 1996. (D.I. 314 at 1258) In addition, Mr. Shaneyfelt testified that, after comparing the Kozlov signatures on the Russian Language Declaration and the Supplemental Declaration of 1980 with the Kozlov signature on the Supplemental Declaration of 1996, he was "not able to make [a] determination" that the Kozlov signature was or was not Mr. Kozlov's personal signature because there were "too many inconsistencies." (D.I. 314 at 1258)

According to Mr. Van Horn, if a foreign company owns the patent application, it is appropriate for a representative of the company to sign the declaration as representative of the owner of the application if he has authority and that authority is clearly indicated. (D.I. 316 at 1454) Thus, there is no requirement that the inventors personally sign the declaration. (D.I. 316 at 1454)

C. The '765 Patent

25. The abstract described the invention claimed in the '765 patent as follows:

> A method for constructing strains which produce aminoacids [sic] comprising combining of a DNA chromosome fragment of a donor microorganism containing genes controlling the synthesis of a selected aminoacid and having a mutation destroying the negative regulation of the synthesis of this aminoacid with a vector DNA molecule to form a hybrid DNA molecule.

> Use is made of a vector DNA molecule capable of providing amplification of the hybrid DNA molecule. The resulting hybrid DNA molecule is used for transforming cells of the recipient strain having the mutation blocking the synthesis of the selected aminoacid in this strain and the mutation partly blocking the related step of metabolism of this aminoacid to yield the strain capable of increased productivity of the selected aminoacid.

(JX 1 at 1)

26. The specification included the following object of the invention claimed:

> to use genetic engineering techniques to prepare strains which produce aminoacids [sic] possessing enhanced capability of producing aminoacids without additional growth factors.

(JX 1 at col. 3, lines 1-4)

27. The '765 patent contains five claims. Claims 1 and 2 are generic claims, drawn to a method of producing a microorganism capable of producing any amino acid. Claims 3 and 4 are specifically drawn to methods of producing strains capable of producing threonine. Claim 1 is the only independent claim; claims 2-4 depend on claim 1. Only claims 1 and 2 are in dispute in this case.

28. Claim 1 reads:

> 1. A method for preparing bacterial strains which produce aminoacids [sic] comprising combining a chromosome DNA fragment of a donor bacterium containing genes controlling the synthesis of a selected aminoacid and having a mutation which destroys the negative regulation of the synthesis of said aminoacid, with a plasmid DNA molecule capable of ensuring amplification, to form a hybrid DNA molecule;

> transforming with said hybrid DNA molecule, cells of a recipient bacterial strain having a mutation blocking the synthesis of the selected aminoacid in said strain and a mutation partly blocking the related step of metabolism of said aminoacid, to yield a bacterial strain possessing increased productivity of the selected aminoacid.

(JX 1 at col. 12, lines 2-15)

29. Claim 2 provides:

> 2. A method as claimed in claim 1, wherein for the removal of ballast genetic material, the hybrid DNA molecule is treated, prior to transforming cells of the recipient strain, with specific endonucleases ensuring cleavage of the hybrid molecule of DNA in predetermined sites of the molecule, followed by recombination and joining of the required DNA fragments with polynucleotide ligase.

(JX 1 at col. 12, lines 16-23)

30. Claim 1 of the '765 patent sets forth the steps for producing genetically engineered bacterial strains which produce amino acids. It teaches a two-step process of combining and transforming. First, a chromosome DNA fragment of a donor bacterial strain is combined with a plasmid DNA molecule capable of ensuring amplification to form a hybrid DNA molecule. The piece of chromosomal DNA from the donor bacterial strain, which is part of the hybrid DNA molecule, has two characteristics: (1) it contains the instruction (or genes) for the production of the selected amino acid and (2) it has a mutation blocking the negative regulation of the synthesis of the amino acid (i.e., feedback inhibition resistance has been destroyed).[15] Second, this

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[15] The patent specification first described several experiments using *E. coli* in which the inventors used an unmutated donor chromosome DNA molecule in combination with a plasmid to form a hybrid DNA molecule. (JX 1 at col. 6, lines 4-22) In these experiments, threonine production did

hybrid DNA molecule is then transformed (or inserted) into a recipient bacterial strain. The recipient bacterial strain must have: (1) a mutation blocking the synthesis of the selected amino acid; and (2) a mutation partly blocking a related step of the metabolism of the selected amino acid. The resulting combination of the hybrid DNA molecule and the recipient bacterial strain has increased production capability of the selected amino acid. The process taught in claim 1 utilizes three major components: (1) a chromosome DNA fragment from a donor bacterial strain; (2) a plasmid DNA molecule; and (3) host cells as the DNA recipient.

31. Claim 2 depends from claim 1 and therefore includes all its limitations. It is directed to a method for removing ballast genetic material from the hybrid DNA molecule before its insertion into the recipient strain. Ballast genetic material is unneeded, unwanted DNA. (D.I. 307 at 166; D.I. 313 at 967) In the method of claim 2, prior to transformation, the hybrid DNA molecule is treated with specific endonucleases (restriction enzymes) at predetermined sites (restriction sites) to provide a mixture of DNA fragments, after which the DNA fragments are recombined (ligated) using the enzyme polynucleotide ligase.

D. The Prior Art

32. The publications characterized by ADM as prior art include: (1) a doctoral thesis authored by David Tribe in December 1976 entitled *Tryptophan Production by Escherichia coli: A Feasibility Study*, ("the Tribe thesis")

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not increase. The specification then set forth Examples 1 and 2, describing the use of a mutated donor chromosome DNA molecule in combination with a plasmid to form a hybrid DNA molecule where threonine production increased. (JX 1 at col. 8, line 45 through col. 10, line 53) In Example 3, the amount of threonine formed by the *E. coli* strains of Examples 1 and 2 is measured. (JX 1 at col. 10, line 55 through col. 11, line 68)

(DX 383); (2) the Kozlov article (DX 321); (3) two articles[16] authored by several of the named co-inventors of the '765 patent (Livshits, Shakulov, Gusyatiner, and Zhdanova) appearing in the publication Genetica 14(6) (June 1978) (collectively the "Genetica articles") (DX 305; DX 326); and (4) the Clarke/Carbon article (DX 290). All of these references are within the field of microbial genetics.

It is undisputed that none of the prior art publications, standing alone, anticipates the teachings of the '765 patent.

33. **The Tribe Thesis: Availability.** ADM relies entirely upon the testimony of Dr. Tribe to establish the availability of the Tribe thesis. According to Dr. Tribe, who received his Ph.D. degree from the University of Melbourne in July 1977, each of the following were sent a copy of his thesis around May 1977: (1) the Baillieu Library at the University of Melbourne; (2) the Heather Jenkins Research Library of the University of Melbourne Department of Microbiology; (3) Professor H.A. Pittard at the University of Melbourne; and (4) Professor Arnold Demane at the Massachusetts Institute of Technology. (D.I. 314 at 1200) Dr. Tribe testified, based on his personal knowledge, that in 1977 both of the libraries had a card catalogue system and were open to the public. (D.I. 314 at 1201-04)

34. At trial, Dr. Tribe had with him a bound copy of his thesis bearing a date stamped by the Heather Jenkins Research Library of October 28, 1977, a copy of which was

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[16] The articles are entitled, respectively, *Investigation of the Allelic State of the relA Gene on the Phenotypic Expression of Mutations of Threonine and Isoleucine Auxotrophy: Communication I. Influence of the allelic state of the relA gene on Phenotypic expression of mutations of threonine and isoleucine auxotrophy in Escherichia coli K-12* ("Genetika I"); and *Investigation of the function of the relA gene in the expression of amino acid operons: Communication II. Influence of the allelic state of the relA gene on oversynthesis of threonine by a mutant of Escherichia coli K-12 resistant to beta-hydroxynorvaline* ("Genetika II").

submitted into evidence. (DX 383) This date-stamped copy was not provided to Ajinomoto during discovery. (D.I. 314 at 1193) According to Dr. Tribe, this date-stamp reflects when the thesis was received, catalogued, and shelved by the Heather Jenkins Research Library. (D.I. 314 at 1200-02) Dr. Tribe testified that his thesis presently is listed in the card catalogue system at the Heather Jenkins Research Library and that he had no reason to believe that his thesis was not accessible to members of the public prior to June 1978. (D.I. 314 at 1200-03)

35. With respect to the copy of the Tribe thesis located in the Baillieu Library, Dr. Tribe testified that he believed his thesis to be listed in the card catalogue system although he had "not directly examined the card index system." (D.I. 314 at 1204) Nevertheless, he stated that he "physically [has] looked at [his] thesis in the [Baillieu] Library." (D.I. 314 at 1205) According to Dr. Tribe, it was his understanding that it takes approximately six months for the Baillieu Library to place items it receives, such as his dissertation, on the shelves. (D.I. 314 at 1205) Dr. Tribe testified that it was his belief that his thesis was placed in the Baillieu Library card catalogue system and was accessible to the public prior to June 1978. (D.I. 314 at 1205-07)

36. However, on cross-examination Dr. Tribe admitted that he was not at the University of Melbourne for most of 1977 and 1978 and that, therefore, there were "many details of the cataloguing with which [he] would not be familiar." (D.I. 314 at 1230)

37. Dr. Tribe also testified that he presented publicly his research findings in the United States on three different occasions prior to June 30, 1978. The first was at the Third Genetics of Industrial Microorganisms Conference, which was held in Madison, Wisconsin in early June 1978. (D.I. 314 at 1214-15) This conference was attended by approximately thirty to forty people. (D.I. 314 at 1214-15)

According to Dr. Tribe, the presentation covered "getting bacteria [ ] to make large amounts of tryptophan." (D.I. 314 at 1215) Dr. Tribe noted that a speaker from Genetika was present at this conference. (D.I. 314 at 1216) Dr. Tribe's second presentation of his findings was at CPC International in Argo, Illinois, also in June 1978. (D.I. 314 at 1216-17) This presentation was attended by approximately 20 industrial workers and covered "getting bacteria by genetic manipulation to make large amounts of tryptophan." (D.I. 314 at 1216-17) The third presentation was in late June 1978 (but before June 30) at the University of Rochester to a group of graduate students and faculty. (D.I. 314 at 1217-18) According to Dr. Tribe, the presentation covered that part of his thesis dealing with "getting bacteria to manufacture tryptophan." (D.I. 314 at 1217-18)

38. According to Dr. Tribe, other presentations of research covered by his doctoral thesis include: (1) the First Australian Biotechnology Conference in Sydney, Australia in 1975 (an oral presentation of a "substantial portion of [his] findings in how to get bacteria to make large amounts of tryptophan"); (2) a paper presented at the Australian Biochemical Society meeting in May 1975 and published in abstract form in the Proceedings of the Australian Biochemical Society (reporting the "first half of [the] major findings in [his] thesis"); and (3) a paper published in the Journal of Bacteriology in 1976 (covering the "major section of the results . . . in [his] thesis and report[ing] them in considerable detail"). (D.I. 314 at 1211-1212)

39. **The Teachings of the Tribe Thesis.** The Tribe thesis discusses the combining of a chromosome DNA fragment (JP2278) containing genes controlling the synthesis of an amino acid (tryptophan), having a mutation (*trpE382*) that destroys the negative regulation of tryptophan, with a plasmid (F'123) as set forth in claim 1 of the '765 patent. (D.I. 313 at 1016) In contrast to the '765 patent, which called for the use

of a plasmid capable of ensuring amplification, the F' plasmid employed by Tribe is a stringent plasmid, which is present in the cell in one or at most two copies.[17] (D.I. 314 at 1104; D.I. 316 at 1522, 1528; D.I. 317 at 1654-60) This type of plasmid, although it can be isolated as an independent entity from the cell, cannot replicate independently from the cell; it only replicates in synchrony with the chromosome.[18] (D.I. 316 at 1522) Moreover, whereas the '765 patent teaches *in vitro* techniques of molecular recombination for producing a hybrid plasmid, the hybrid plasmid in the Tribe thesis is formed using *in vivo* recombination/transduction. (D.I. 314 at 1105-06; D.I. 316 at 1528-29; D.I. 317 at 1661)

40. Tribe also teaches the insertion of a hybrid plasmid into a recipient bacterial strain that has a mutation (Δ*trpE5*) completely blocking the synthesis of the selected amino acid. In contrast to the '765 patent, which employed transformation in this step, the hybrid F' plasmid used by Tribe entered the

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[17] In asserting that the F' plasmid used by Dr. Tribe was capable of amplification, ADM relies on a statement appearing in a textbook on bacterial genetics that "in a rapidly growing cell, the number of F prime plasmids must, of course, be larger than two to allow for the shorter time between cell divisions." (D.I. 316 at 1558-1559; D.I. 317 at 1627) When questioned regarding this assertion, Dr. Falkinham explained that replication of F' plasmids is initiated with that of the chromosome but because of their smaller size (5% of the chromosome) their replication takes a shorter period of time. (D.I. 316 at 1559) Thus, according to Dr. Falkinham, one would expect to find between one and two copies of F' plasmids per chromosome equivalent in a rapidly growing cell. (D.I. 316 at 1559)

[18] Dr. Tribe did recognize that manipulating the number of copies of the plasmid might further improve tryptophan yield. (D.I. 383 at 177) In his summary, Dr. Tribe stated that "increases in tryptophan yield were obtained by amplification of . . . tryptophan enzyme levels through introduction of extra, plasmid borne copies of *trp* genes." (D.I. 383 at iii) In addition, he recognized that work was underway "towards obtaining mutants of the multi-copy plasmid Co1El'-*trp* . . . in which the anthranilate synthase encoded by the [plasmid's] *trp* genes is feedback resistant," but that there were problems with this approach. (D.I. 383 at 144)

recipient bacterial cell via conjugation (the F'521 plasmid being too large for transformation). (D.I. 307 at 113; D.I. 308 at 321-22; D.I. 313 at 1013-16, 1019; D.I. 316 at 1561; D.I. 317 at 1662) Conjugation is a natural "mating" process involving cell-to-cell contact between the donor and the recipient *E. coli* cells and the transfer of genetic material, in this case the plasmid. (D.I. 316 at 1016) In contrast to conjugation, transformation, as defined in the '765 patent, involves the "transfer of genetic bacterial material to a bacterial cell by means of isolated DNA." (JX 1 at col. 1, lines 19-20)

41. Tribe employed an auxotrophic host strain for the same purpose as did the '765 inventors: to make it easier to select bacterial strains containing the hybrid plasmid carrying the genes for the synthesis of the selected amino acid. (D.I. 314 at 1102; D.I. 317 at 1653-54; JX 1 at col. 5, lines 43-47) Tribe does not teach the use of an auxotrophic host for the over expression of tryptophan; rather Tribe affirmatively stated that one should use a non-auxotrophic host, because it would increase gene number. (D.I. 316 at 1523; D.I. 317 at 1654; D.I. 314 at 1102; D.I. 316 at 1523) Nowhere in the Tribe thesis is it suggested that an auxotrophic host be used in the over production of the selected amino acid. (D.I. 314 at 1102)

42. Tribe does not teach the use of a mutation partly blocking the related step of metabolism of the selected amino acid. Rather, the tryptophanase auxotrophy disclosed in the Tribe thesis is a complete block. (D.I. 316 at 1522; D.I. 317 at 1658) In fact, according to Dr. Frederick B. Rudolph (ADM's expert witness), Tribe stressed that a complete block was desired because metabolism of the amino acid was to be avoided. (D.I. 314 at 1109; D.I. 317 at 1658)

43. Tribe does teach the use of a recipient strain carrying a *trpS378* mutation. The *trpS378* mutation is a temperature

sensitive mutation,[19] the phenotypic expression of which appears at temperatures greater than 37 degrees Celsius. (D.I. 316 at 1528) According to Dr. Rudolph, the benefit of the *trpS378* mutation is that at higher temperatures (42 degrees Celsius or higher) the enzymatic activity of the product of the *trpS378* gene decreases, thereby increasing the level of tryptophanol-tRNA which lowers the level of repression of the tryptophan operon.[20] (D.I. 317 at 1621-23, 1657) Derepression of the tryptophan operon has the effect of increasing tryptophan pathway enzyme levels, ultimately resulting in an increase in tryptophan production. (D.I. 317 at 1621-23, 1657) Although Dr. Rudolph initially stated that the *trpS378* mutation was a mutation partially blocking the related step of metabolism of tryptophan (D.I. 313 at 1018-19), on rebuttal cross-examination he indicated that such was not really the case, but that the mutation was "very analogous to the isoleucine part in that the isoleucine does exactly the same thing." (D.I. 317 at 1657-58) He went on to state that Dr. Tribe's focus on the *trpS378* mutation was not for its role in blocking a related step in metabolism, but for its role in derepressing the tryptophan operon. (D.I. 317 at 1658)

44. Dr. Rudolph ultimately conceded that not a single strain constructed by Dr. Tribe had all the characteristics set forth in claim 1 of the '765 patent. (D.I. 317 at 1653) And as indicated in a letter dated February 6, 1990 from ADM's George Stauffer to John Reed, then ADM's Vice President of International, following their meeting with Genetika, both of the characteristics of the recipient strain set forth in claim 1 (i.e., a mutation blocking the synthesis of the selected amino

[19] A temperature sensitive mutation is one whose enzymatic activity is affected by the temperature. (D.I. 317 at 1621-23)

[20] According to Dr. Falkinham, *E. coli* were normally grown at 37 degrees Celsius. (D.I. 316 at 1527) Dr. Falkinham also testified that one would not grow *E. coli* at 42 degrees Celsius for commercial production because at higher temperatures bacteria stop growing and proteins denature. (D.I. 316 at 1526-27)

acid and a mutation partly blocking the related step of metabolism of the amino acid) are "important advantage[s]" of the Genetika strains. (JX 12)

45. **The Kozlov Article: Availability.** It is undisputed that the Kozlov article, which was authored by several of the '765 inventors, is prior art. (DX 321) This article was referenced in the specification of the '765 patent. (JX 1 at col. 1, lines 56-58). A copy of this publication was not provided to the PTO by the inventors during the prosecution of the patent.

46. **The Teachings of the Kozlov Article.** The Kozlov article teaches a method for the isolation of specific chromosomal markers whereby, using *in vitro* techniques, a chromosomal DNA fragment containing some of the genes necessary for amino acid production[21] is ligated with amplifiable plasmid DNA forming a hybrid plasmid that is used to transform an auxotrophic host strain.

47. With respect to claim 1, the Kozlov article does not teach: (1) the creation of a bacterial strain capable of over production of a selected amino acid; (2) the use of a chromosomal DNA fragment containing "the genes controlling the synthesis of a selected amino acid"; (3) the use of a chromosomal DNA fragment having a mutation making it feedback resistant; and (4) a recipient strain having a mutation partly blocking the related step of metabolism of the

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[21] Because Kozlov used the endonuclease EcoRI in the digestion of the chromosomal DNA, the chromosomal threonine marker which resulted contained only functional *thrA* and *thrB* genes rather than the complete threonine operon. (D.I. 316 at 1520-21) This incomplete threonine operon was not feedback resistant. (D.I. 316 at 1521) However, had Kozlov used the restriction enzyme HindIII, he would have isolated a chromosome DNA fragment containing *thrA*, *thrB*, and *thrC* genes, i.e., the complete threonine operon. (D.I. 316 at 1563) The '765 patent disclosed the use of HindIII to digest chromosomal DNA although the '765 inventors were not the first to do so. (D.I. 316 at 1564)

selected amino acid. (D.I. 316 at 1519-22; D.I. 317 at 1649-50)

48. **Genetika I & II:[22] Availability.** The court has previously concluded in its decision of October 21, 1996 that the Genetika articles were prior art, finding that there existed sufficient indicia of their availability.[23] (D.I. 272 at 45) Copies of these articles were not submitted to the PTO during the prosecution of the '765 patent. However, Genetika II was listed in the reference section and cited to in the specification of the Russian priority patent, a certified English translation of which was provided to the PTO as part of the U.S. patent application. (PX 2)

49. **The Teachings of the Genetika Articles.** The Genetika articles describe the relevance of the allelic state of the *relA* gene to the over synthesis of threonine. These publications also describe the donor and recipient *E. coli* strains used in the examples of the '765 patent. Both Genetika I and II describe the strain MG442, the donor strain in the '765 patent, as containing the genes controlling threonine production, having a mutation (*thrA442*) destroying the negative feedback regulation of threonine synthesis, and having a mutation (*ilvA*) partly blocking a related step of threonine metabolism. (D.I. 313 at 1023-25; D.I. 317 at

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[22] Dr. Rudolph, in his expert report, treated the two Genetika articles as equivalent and thus cumulative of each other. (D.I. 201, Ex. Q at ¶ 15) Therefore, the citation to one or the other is sufficient. *See Halliburton co. v. Schlumberger Technology Corp.*, 925 F.2d 1435, 1440 (Fed. Cir. 1991).

[23] Ajinomoto contests the court's holding of the prior art status of the Genetika articles, arguing that the court mistakenly relied upon incomplete information in reaching its conclusion that the references, which are cited in the Russian priority patent, were publicly available. (D.I. 323 at 49) The "complete" information referred to by Ajinomoto includes two copies of the articles bearing U.S. library date stamps of September 1978 and Dr. Debabov's deposition testimony that the inventors knew of the citations prior to publication and included them in the patent application even though the articles were not publicly available. (D.I. 323 at 49-50)

1632-1636; DX 305 at 671; DX 326 at 664) In addition, Genetika I describes the strain VL334, the recipient strain in the '765 patent, as having a mutation (*thrC1010*) blocking the synthesis of threonine and a mutation (*ilvA442*) partly blocking a related step in the metabolism of threonine. (D.I. 313 at 1023-25; D.I. 317 at 1632-1636; DX 326 at 661, 664) Genetika II teaches that the two mutations found in MG442—a mutation destroying feedback resistance (*thrA442*) and a mutation partly blocking the related step of metabolism (*ilvA*)—positively contribute to threonine over production. (DX 305 at 675)

50. Genetika I and II do not teach or suggest the claimed invention.As admitted by Dr. Rudolph on cross-examination, neither Genetika I nor Genetika II mention or suggest the use of plasmids or the construction of plasmids, much less the formation of hybrid plasmids. (D.I. 317 at 1640-41) In addition, neither publication discusses the isolation or increase in copy number of a feedback resistant operon or the use of an auxotrophic host for the production of threonine. (D.I. 316 at 1518)

51. **The Clarke/Carbon Article: Availability.** The Clarke/Carbon Article was published in November 1975 and was referenced in the specification of the '765 patent, although a copy of the article was not provided to the PTO during the prosecution of the '765 patent. (JX 1 at col. 1, lines 52-53)

52. **The Teachings of the Clarke/Carbon Article.** The Clarke/Carbon article discusses a method using *in vitro* techniques for the isolation of specific segments of the *E. coli* genome similar to that set forth in the Kozlov article. The article teaches the digestion of plasmids and *E. coli* DNA with an endonuclease, followed by treatment with an exonuclease and then attachment of "connectors." (DX 290 at 4362) The mixture of annealed, but not ligated, hybrid DNA was used to transform *E. coli* auxotrophs, followed by selection for a specific chromosomal marker. (DX 290 at

4362) The isolated bacterial strains contained hybrid plasmids carrying either the entire tryptophan or the arabinose and leucine operons. (DX 290 at 4364) According to Clarke/Carbon, the bacterial strains containing the hybrid plasmids carrying the tryptophan operon produced elevated levels of trp-mRNA. (DX 209 at 4364) However, increased levels of tryptophan production were not reported.

53. With respect to claim 2, the last paragraph of the discussion section of the Clarke/Carbon article mentions, as one of the advantages in having gene systems isolated and cloned on plasmids carried by bacteria, that

> hybrid plasmids containing specific *E. coli* genes may be easily manipulated or made smaller by shearing or endonuclease digestion. New vectors can then be isolated which bear known *E. coli* gene systems that may be useful in the isolation and cloning of genes from other organisms. Thus, the insertion of foreign DNA into an *E. coli* operon, bringing the expression of that DNA under control of bacterial regulatory sequences, should be readily achieved.

(DX 290 at 4365; D.I. 313 at 1023) According to Dr. Rudolph, the Clarke/Carbon article, by stating that hybrid plasmids can be made smaller by endonuclease digestion, rendered the ballast removal step of claim 2 of the '765 patent obvious. (D.I. 313 at 1022-23)

E. The Scope of the '765 Patent

54. Claims 1 and 2 of the '765 patent are generic claims directed to a method of constructing a microorganism capable of producing any amino acid.

55. At the time of the invention, approximately 50,000 different bacterial species were thought to exist, of which approximately 4000 had been identified. (D.I. 314 at 1178-80) There are twenty amino acids. (D.I. 307 at 105; D.I. 313 at 959) Thus, in theory, the process of claims 1 and

2 of the '765 patent covers at least 1 million possible different combinations of bacterial species and amino acids.

56. The specification of the '765 patent sets forth specific methods for preparing a single strain of *E. coli* bacteria capable of overproducing the amino acid threonine. (JX 1)

57. Prior to becoming the assignee of the '765 patent, Ajinomoto argued, during the prosecution of seven patent applications, that the specification of the '765 patent did not enable the full scope of the claims. (PX 218; PX 219; PX 221; PX 222; PX 223; PX 224; PX 225) However, in each instance, the PTO Examiner rejected Ajinomoto's argument, finding that the patent was enabled since the types of mutations suggested by the patent were conventional and one skilled in the art could easily produce such mutants because genetic engineering techniques were conventional and well-known. (PX 218 at 98-101, 128, 219-221; PX 219 at 119-20; PX 221 at 65-6; PX 222 at 139; PX 223 at 89-90; PX 224 at 106-07; PX 225 at 106-07) In particular, various PTO Examiners stated at various times:

> One skilled in the art could practice the invention using as the DNA donor any microorganism having a mutation in the negative regulation of the synthesis of the amino acid and as the recipient a microorganism which has a mutation partly blocking a related step of the metabolism of the amino acid. No particular organisms are required as evidenced by claims 1 and 2 of [the '765 [patent] which are not restricted to any microorganisms. **The types of mutations suggested by [the '765 patent] are conventional and have been used repeatedly to cause microorganisms to produce more amino acid product. The literature is replete with microorganisms which could be used.** [The '765 patent's] contribution was using genetic engineering to produce another microorganism.

(PX 218 at 220) (emphasis added).

> **The methods taught by [the '765 patent] are predictable and can be practiced with starting materials cited in the patent, or their well-know[n] equivalents, all available to one of ordinary skill in the art.**
>
> > . . . When a case involves *starting materials which are already known and available to persons in the art at the time of filing* an application for patent, the description need not contain an enabling disclosure of them . . .
> >
> > Ex parte Argoudelis[,] 157 USPQ 437[,] 441

(PX 223 at 88) (alteration in original) (emphasis added).

> [The '765 patent] provides an adequate disclosure for one skilled in the art to practice the invention whether or not the microorganism is available . . . . In order to practice the invention of [the '765 patent] to make any amino acid, one skilled in the art could use any mutant which has the characteristics disclosed by the patent and successfully produce amino acids.

(PX 222 at 139) (emphasis added).

> **Such mutant strains for a particular amino acid are well known in the art and their use would be obvious.** Moreover, the broad claims are not restricted to any particular strains.
>
> * * *
>
> [The '765 patent] **provides an adequate teaching to one skilled in the art to produce any amino acid from available mutants.**

(PX 224 at 106-07) (emphasis added).

> Claims 1-18 are rejected under 35 U.S.C. 103 as unpatentable over [the '765 patent] . . . [which shows] producing amino acids by combining the DNA of a donor microorganism, such as *E. coli*, which has a

mutation in the genes destroying the negative feedback, such as being resistant to an analogue of the amino acid, with a vector and transforming an *E. coli* mutant, which requires an amino acid, with the hybrid DNA to increase the amino acid production. The production of any amino acid, such as L-glutamic acid, and the approp[ri]ate mutant would be obvious since **such mutation techniques are conventional and well known.**

(PX 219 at 140) (emphasis added).

58. **Elements of Claims 1 and 2.** In order to practice claims 1 and 2 of the '765 patent, a single chromosome fragment containing the genes controlling the synthesis of the selected amino acid must be isolated and obtained. (JX 1) According to Dr. Rudolph, in the late 1970's the biochemical pathways for amino acid synthesis in all bacterial species were not known; in particular, the method of regulation of the pathways was not known. (D.I. 313 at 939, 948, 1008-09; D.I. 314 at 1179-80) Although the steps in the biosynthetic pathway of an amino acid are generally the same across species, the regulation method varies from species to species. (D.I. 313 at 948) For example, the genes controlling the synthesis of threonine in *E. coli* differ from those in *Corynebacteria*, as does the method of regulation. (D.I. 314 at 944-48) In fact, some bacterial species cannot make certain amino acids. (D.I. 301 at 100)

59. Both Dr. Falkinham and Dr. Rudolph agreed that claim 1 calls for a single chromosome fragment containing the genes controlling the synthesis of a selected amino acid. (D.I. 308 at 311; D.I. 313 at 950-02, 963, 997) To isolate such a fragment, said genes must be contiguous. (D.I. 308 at 311; D.I. 313 at 963) However, all the genes controlling the synthesis of a selected amino acid are not always contiguous. (D.I. 313 at 1016; D.I. 313 at 947, 954, 997-98, 1009, 1041; DX 495) For example, although in *E. coli* the three genes of the threonine operon are contiguous as are the five genes of

the tryptophan operon and the nine genes of the histidine operon, the genes controlling the synthesis of arginine and methionine are not contiguous. (D.I. 308 at 301; D.I. 313 at 997) And in *Brevibacteria* and *Corynebacteria*, the genes controlling the synthesis of threonine are located on separate, noncontiguous segments of the chromosome. (D.I. 313 at 944-48; DX 495; DX 1108 at 80) In fact, in *E. coli*, the *asd* gene, the product of which catalyzes the second step in the threonine pathway, is not contiguous with the genes of the threonine operon. (D.I. 313 at 947, 953-54, 1041, 1060-61; D.I. 314 at 1169) Therefore, with respect to *E. coli*, a single chromosome fragment cannot contain the *asd* gene and the threonine operon. (D.I. 308 at 323-24; D.I. 313 at 947, 1060-61)

60. In order to isolate the desired chromosome fragment, the appropriate restriction endonuclease must be employed. (D.I. 307 at 114-116; D.I. 313 at 950-53) Each endonuclease recognizes a unique sequence of basepairs in DNA, cutting only at those sites; therefore, cutting a particular DNA molecule with a particular restriction enzyme, such as BamHI or EcoRI, always yields a particular group of fragments. (D.I. 307 at 114-16) Once obtained, these fragments can be inserted into a plasmid that has been cleaved using the same restriction endonuclease, thereby generating insertion sites. (D.I. 313 at 950-53)

61. To isolate the hybrid plasmid carrying the chromosome fragment of interest, the plasmids are inserted into a recipient bacterial strain that is auxotrophic for the selected amino acid; through a complementation process (growth on a medium devoid of the desired amino acid), it is determined whether the hybrid plasmid carries the genes of interest. (D.I. 313 at 950-53) If the desired chromosome fragment is not isolated, the process must be repeated using a different restriction endonuclease. (D.I. 313 at 950-53) According to Dr. Rudolph, these techniques are routinely performed in the

laboratory and it takes approximately one day to conduct one such sequence, from digestion with the restriction enzyme to selection of the desired strain. (D.I. 313 at 1058-59)

62. On cross examination, Dr. Rudolph testified that as of 1978 one of ordinary skill in the art would be able to use the basic *in vitro* techniques necessary for recombinant cloning, including how to use ligase and a ligation reaction and how to conduct restriction digest using restriction endonucleases. (D.I. 313 at 1047)

63. Claim 1 of the '765 patent requires the use of a plasmid suitable for constructing a hybrid plasmid for transforming another bacterial strain. (JX 1) Although at the time of the invention, *E. coli* was well characterized and the plasmid pBR322 was readily available, plasmids suitable for making hybrid plasmids capable of transforming other bacterial species were not as well developed. (D.I. 313 at 998-99, 1007, 1009) According to an article authored by Dr. Debabov entitled *Advances in the Genetic Engineering of Microorganisms*, "[t]he extension of genetic engineering techniques to . . . microorganisms [other than *E. coli*] requires additional investigation." (DX 165; DX 1100 at 132-33) Thus, at the time of the invention, the technology with respect to *E. coli* was more developed than it was for other industrial microorganisms. (DX 1100 at 132-33) For example, Dr. Rudolph testified that based on his experience with the bacteria *Clostridium*, plasmids suitable for use in transformation are not known for all bacterial species and therefore must be developed. (D.I. 313 at 998-9, 1007, 1009)

64. At the time of the invention, transformation techniques available for *E. coli*, although relatively well-known, were not universally applicable to other bacteria. (D.I. 313 at 958, 998-99, 1009, 1047) Dr. Rudolph testified that at that time he "had trouble in his own work with transformation." (D.I. 313 at 1048) According to an article authored by Konosuke Sano, senior chief scientist at Ajinomoto, entitled *Host-Vector*

Systems for Amino Acid-Producing Coryneform Bacteria, the development of a host-vector system was necessary before recombinant DNA technology could be applied to *Coryneform* bacteria because the *E. coli* systems were not available. (DX 102 at 486) This concern was reiterated by Shukuo Kinoshita in a chapter he authored in *Biology of Industrial Microorganisms*, in which he stated that there exist various problems hindering the application of recombinant DNA technology for improving *Coryneform* glutamic acid producing bacteria. (DX 373 at 124-26) Similarly, Kiyoshi Miwa, head of the Pharmaceutical Biomedical Research Laboratory of the Applied Research Division of the Central Research Laboratory of Ajinomoto, admitted there were points which had to be "overcome" with respect to the expression of heterologous genes in *Coryneform* bacteria using plasmids capable of transforming the bacteria. (DX 1109 at 109-11, 117)

65. Claim 2 of the '765 patent requires the use of a recipient bacterial strain having a mutation blocking the synthesis of the selected amino acid and a mutation partly blocking the related step of metabolism of said amino acid. (JX 1) The patent does not disclose the extent of the partial block necessary to practice the claimed invention or how to isolate a bacterial strain containing the two required mutations. (D.I. 313 at 1000-03, 1010-11, 1049-53; D.I. 314 at 1091-94, 1165, 1178) Even Genetika reported difficulty creating an *ilvA* mutation in two strains of bacteria, VL1991 and a derivative VL1997. (DX 79 at 9096)

66. Dr. Rudolph testified on cross-examination that one of ordinary skill in the art at the time of the invention would know how to use nitrosoguanidine as a mutagen to make specific mutants. (D.I. 313 at 1048) In addition, he testified that at the time of the invention, feedback resistant mutants were known in the literature. (D.I. 313 at 1049-50) He further opined that one skilled in the art **should** be able to

isolate amino acid auxotrophic mutants, but that the ability to do so might vary from amino acid to amino acid and strain to strain. (D.I. 313 at 1049-50) Dr. Rudolph also opined that, in the context of the Tribe thesis and *E. coli*, one skilled in art at the time of the invention could have carried out these mutations for all twenty of the amino acids. (D.I. 1052-53)

F. The Availability of the Strains

67. There are four strains mentioned in the claims of the '765 patent: the donor strain MG442, the recipient strain VL334, and two product strains, VL334(pYN6) and VL33 (pYN7). These strains are further identified by the registration numbers given them by the Central Museum, as follows:

Strain	*Registration No.*
MG442	CMIM B-1628
VL334	CMIM B-1641
VL334 (pYN6)	CMIM B-1649
VL334 (pYN7)	CMIM B-1684

68. During the prosecution of four patent applications submitted by Ajinomoto prior to its acquisition of the '765 patent, the PTO Examiners specifically found that the strains were available to the public. (PX 223 at 89) The PTO Examiners also found the '765 patent to be enabled without the required deposits:

> Moreover, and in any case, the teaching in [the '765 patent] is considered sufficient to enable the ordinary skilled artisan to practice the ['765 patent] **even where the specific mentioned starting microorganism and host microorganisms are not available.** Analogous microorganisms are well known and access thereto is readily avail[a]ble.

(PX 218 at 100-01) (emphasis added).

> [The '765 patent] provides an adequate disclosure for one skilled in the art to practice the invention **whether or not the microorganism is available** and applicants have not shown that it is not. In order to practice the invention of [the '765 patent] to make any amino acid, one skilled in the art could use any mutant which has the characteristics disclosed by the patent and successfully produce amino acids.

(PX 222 at 139) (emphasis added); (PX 219 at 119-20).

69. Dr. Rudolph testified that dependent claims 3 and 4 were enabled without deposits. (D.I. 314 at 1115-16)

70. **The Degussa Inquiry.** On March 3, 1994 Degussa, a German company that competes with Ajinomoto and ADM in the threonine industry, wrote to Genetika inquiring about the formal requirements that must be fulfilled and the fees required to obtain various bacterial strains, including VL334-(pYN7). (D.I. 315 at 1376-79; DX 88 at 25386) This inquiry did not conform with the Budapest Treaty on the International Recognition of the Deposit of Microorganism for the Purpose of Patent Procedure.[24]

71. In accordance with Genetika's agreement to provide Ajinomoto with information on contacts between Degussa

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[24] The Budapest Treaty on the International Recognition of the Deposit of Microorganism for the Purpose of Patent Procedure governs the proper method of making a biological deposit, the accepted depositories, and the proper procedures to be followed for requesting a deposit. With respect to the United States, the Budapest Treaty entered into force on August 19, 1980. (D.I. 98, Ex. 1) The former Soviet Union did not join the Budapest Treaty until April 22, 1981. (D.I. 98, Ex. 1) The strain VL334(pYN7) was deposited in 1978. (DX 156 at 58, 125)

According to Dr. Paraskevov, if Genetika received a request for deposited threonine-producing strains that conformed with the Budapest Treaty, it was obliged to supply the strain without first contacting Ajinomoto. (DX 1118 at 48-53) However, if the request was non-conforming, then Genetika would consult with Ajinomoto because Ajinomoto had the exclusive rights to the strains. (DX 1118 at 48-53)

and Genetika, for which Genetika was paid $20,000, Genetika's Dr. Paraskevov informed Yoshikazu Takayanagi, then section manager of Ajinomoto's Patent and Licensing Department, of the request. (D.I. 315 at 1359, 1376-79; DX 88) In a letter dated March 18, 1994, Mr. Takayanagi told Dr. Paraskevov that he believed Dr. Paraskevov to be "under no obligation to provide [ ] such strains to Degussa . . . because these strains of Degussa's request are not the subject matters of German patents." (D.I. 315 at 1383; DX 89 at 1) In addition, as was common practice between Ajinomoto and Genetika, Mr. Takayanagi provided Dr. Paraskevov with suggested language to use in response letters to Degussa:

> Meanwhile please respond to Degussa as follows:
>
> "We duly received your letter of March 2, and March 16, 1994, now we are consulting this matter with Russian Ministry of Technology and Science and Russian Patent Office, so [ ] please give us a few weeks for our definitive reply to you[.]"
>
> [A]nd a few weeks later you will send the second letter to Degussa indicating that: "Upon instruction of Russian Ministry of Technology and Science and Russian Patent Office, we regret to inform you that we are determined not to provide[ ] you with the strains of your request.

(D.I. 315 at 1383-85; DX 89 at 1) In a subsequent letter to Dr. Paraskevov dated June 8, 1994, Mr Takayanagi told him to "please send a refusing letter to Degussa. . . . We think the purpose of Degussa is to obtain strains from you under no obligation and to modify them to patent free strains for use by Biotika or Fermas." (DX 91)

When Degussa sent Genetika a request conforming to the Budapest Treaty on January 8, 1996, it was told it would receive the samples. (DX 167; DX 1118 at 43-44)

72. **The Pardo Inquiry.** In January 1994, Dr. Daniel Pardo of Eurolysine wrote to Genetika inquiring as to the procedure for ordering the bacterial strain B3996. (DX 168 at 3) No other strain was mentioned in the body of the letter. However, an attachment to the letter entitled "List of VNII Genetika *E. coli* strains" lists seven strains; item number 3 on this list is the strain VL334(pYN7). (DX 168 at 4) Listed as item number 7 is the strain B3996. (DX 168 at 4) Of the items listed, only this item has the notation following it: "Please confirm the availability of this strain since it was deposited for patent purpose . . ." (DX 168 at 4)

73. On January 26, 1994, Mr. Paraskevov sent Mr. Takayanagi a copy of Dr. Pardo's request, inquiring as to how Genetika should proceed. (DX 168 at 1) Mr. Takayanagi replied that Dr. Paraskevov had "no legal obligation[ ] to comply with the request of Dr. Pardo," advising Dr. Paraskevov to ignore the request for the moment. (DX 137 at 1; D.I. 315 at 1388) On February 4, 1994, Mr. Takayanagi reiterated to Dr. Paraskevov that he should "feel no responsibility to respond to or comply with the letter of Dr. Pardo dated January 21, 1994, unless or until you receive a[ ] official letter with a certificate of French Patent Office from him." (DX 95 at 1) Mr. Takayanagi went on to state that "among the strains of Dr. Pardo's request, the strain under international deposit is only VKPM B-3996, all other strains are domestic deposit under [U.S.S.R.] or Russian Laws, so that you will refuse to furnish him these strains citing appropriate Russian laws." (DX 95 at 1)

74. Dr. Pardo's inquiry, also, did not conform with the Budapest Treaty.[25]

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[25] The court granted Ajinomoto's motion *in limine* "to exclude the testimony of and documents relating to Dr. Andrei Sibirny" and his request for strains. (D.I. 278 at ¶ 5)

G. The Role of relA in the Over Production of Threonine

75. The court has already recognized that "the best mode of practicing the '765 invention requires that the bacterial host be characterized by the presence of a *relA*$^+$ gene." (D.I. 274 at 42) The specification does not explicitly characterize the bacterial host by the presence of a *relA*$^+$ gene or disclose the importance of this gene. (D.I. 274 at 42)

76. **The Relevance of the relA gene.** At the time of the invention, it was known to one of ordinary skill in the art that under conditions of amino acid starvation the operons of **certain** amino acids were positively regulated by the product of the wild type allele of the *relA* gene. (D.I. 314 at 1088-89; D.I. 316 at 1512; DX 326 at 660, 665; DX 305 at 668, 675)

77. The significance of the *relA* gene with respect to the synthesis of threonine was reported by some of the inventors of the '765 patent in Genetika I and Genetika II, which were published at the time the '765 patent application was filed. (DX 326; DX 305) Both publications discuss the relevance of the allelic state of the *relA* gene to the phenotypic expression of certain mutations in the threonine operon (*thrA442*) and the isoleucine-valine operon (*ilvA*) and the over synthesis of threonine. Each concludes that the operons controlling threonine and isoleucine synthesis are positively regulated by the product of the wild type *relA* gene and that under conditions of isoleucine deficiency, the wild allele of the *relA* gene has a positive influence on the over synthesis of threonine. (DX 305 at 675-76; DX 326 at 665-66) Thus, these publications disclose that the threonine operon is one of those amino acid operons the transcription of which is stimulated by the product of wild type *relA* gene. It is undisputed that not all *E. coli* strains have the *relA*$^+$ gene. (D.I. 313 at 996; D.I. 316 at 1533)

According to Dr. Rudolph, one of ordinary skill in the art being familiar with the literature, particularly the Debabov

article and Genetika I and II, would have been able to determine the best mode of practicing the '765 invention. (D.I. 314 at 1088) Dr. Falkinham goes one step further concluding that one of ordinary skill in the art would have known that *relA*$^+$ is required to practice the claimed invention. (D.I. 316 at 1512)

78. **The Presence of relA$^+$ in Leaky Auxotrophs.** According to Genetika I and II, "introduction of the *relA* mutation into the genome of semiauxotrophic strains with respect to threonine and isoleucine leads to the appearance of a strict dependence of their growth on the presence of those amino acids in the medium." (DX 326 at 665; DX 305 at 675) Through a series of experiments, the researchers concluded that the effect of the *relA*$^+$ gene on a leaky auxotroph is to make it a complete auxotroph. (D.I. 313 at 993; D.I. 314 at 1090; D.I. 316 at 1533-38; D.I. 317 at 1638, 1643-44; DX 305; DX 326) Therefore, as reiterated by Dr. Falkinham, the literature supports a finding that the *relA*$^+$ gene is inherently present whenever a leaky mutation is obtained. (D.I. 316 at 1512, 1515)

79. The inventors of the '765 patent disclosed the preparation of strains VL334(pYN6) and VL334(pYN7), the only strains at the time of the ' 765 patent application reduced to practice. It is undisputed that the parent strain of VL334 is MG442, a *relA*$^+$ strain. (D.I. 313 at 992-93; D.I. 314 at 1091) According to Dr. Falkinham, in the absence of any indication that there was a change in the allelic state of the *relA* gene, one skilled in the art would conclude that VL334 was also *relA*$^+$ (D.I. 316 at 1512, 1540-41)

80. **Bacterial Strain Nomenclature.** According to Dr. Falkinham, the general practice in describing the genetic characteristics of bacterial strains is to list only mutations of genes; thus, anyone skilled in the art reading the specification of the '765 patent would know, since none of the recipient strains contain the *relA* gene in their description, that the

strains are *relA*$^+$. (D.I. 316 at 1540-41) This "practice" is not followed by the inventors to the extent that they did not disclose in the '765 patent the *supE* gene (the amber mutation), a common mutation in the early strains of *E. coli* K- 12, even though it is mutated in VL334. (D.I. 316 at 1575; DX 305 at 669; DX 326 at 661) Therefore, it cannot be concluded that the allelic state of the *relA* gene was disclosed through the nomenclature employed in the '765 patent.

H. Genetika's Threonine-Producing Bacterial Strains

81. According to the '765 patent, the plasmid pYN7 is constructed from either pYN6 or pYN10 using the '765 process. Either plasmid is treated with specific endonuclease followed by treatment with a polynucleotide ligase. (JX 1 at col. 10, lines 17-22) The resulting preparation is used for transformation, and clones with a specific phenotype are selected. (JX 1 at col. 10, lines 22-25) The plasmid with molecular weight 5.7 megadaltons (Md),[26] pYN7, was isolated from an arbitrarily selected clone. (JX 1 at col. 10, lines 25-27) This hybrid plasmid is composed of two fragments, the greater portion corresponding to the plasmid pBR322 and the other a fragment of DNA chromosome of the strain MG442 containing all of the genes of the threonine operon. (JX 1 at col. 10, lines 27-36) The plasmid pYN7 is used for transformation of the strain *E. coli* VL334, which has mutations in the *thrC* gene and the *ilvA* gene capable of blocking synthesis of L-threonine and an adjacent pathway of L-threonine metabolism. (JX 1 at col. 10, lines 36-42) The resultant strain, VL334(pYN7), is resistant against penicillin and capable of growing on a medium without amino acids. (JX 1 at col. 10, lines 43-48) In each cell, there are approximately twenty copies of the pYN7 plasmid. (JX 1 at col. 10, lines 49-51)

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[26] This conflicts with the information provided in the Russian priority patent, where the molecular weight of the plasmid pYN7 was set forth as 7.1 Md. (PX 2 at 92)

82. After constructing VL334(pYN7), Genetika continued to conduct research aimed at constructing threonine-producing strains. By 1979, the Genetika inventors developed the bacterial strain M1(pYN7). The inventors obtained U.S. Patent No. 4,321,325 ("the '325 patent") entitled "Process for Producing L-threonine," for the method of producing threonine using the M1(pYN7) strain. (DX 61) M1(pYN7) was not made by using the process claimed in the '765 patent. Rather, M1(pYN7) was selected on the basis of the natural variability of VL334(pYN7) by "being inoculated to an agar-doped culture medium." (DX 61 at col. 3, lines 14-17, 45-46) The strain M1(pyN7) was isolated by selecting for colonies able "to produce L-threonine on a minimal glucose-salt nutrient medium and to retain the plasmid in the course of fermentation." (DX 61 at col. 3, lines 47-51) The location of the mutation, whether on the plasmid or on the chromosome and the specific gene affected, is unknown. (D.I. 308 at 274-76; D.I. 313 at 968-70) M1(pYN7) differs from VL334(pYN7) in, *inter alia*, having greater stability and an increased threonine-producing capacity (the average rate of accumulation of threonine by M1(pYN7) being five times greater than that of VL334(pYN7) and M1(pYN7) producing 50% more threonine than did VL334(pYN7)). (DX 61 at col. 4, lines 28-53; col 6, lines 28-31) It is undisputed that M1(pYN7) and VL334(pYN7) are different strains. (D.I. 308 at 319; D.I. 313 at 969-70)

83. The Genetika inventors continued their research using the M1(pYN7) strain. In 1992, the inventors obtained U.S. Patent No. 5,175,107 ("the '107 patent"), entitled "Bacterial Strain of Escherichia Coli BKIIM B-3996 as the Producer of L-threonine." (DX 15) The '107 patent covers the bacterial strain of *E. coli* BKIIM B-3996 as the producer of L-threonine. In setting forth a method of constructing B-3996 from M1, the '107 patent made reference to an intermediate strain, G472T23. (DX 15 at col. 2, lines 26-31) G472T23

was made through a two-step process: (1) transduction of M1 by a bacteriophage bearing a determinant of saccharose assimilation, followed by (2) selection of spontaneously arisen mutants. (DX 15 at col. 2, lines 14-26) The G472T23-(pYN7) strain was isolated as one of the mutant strains. G472T23(pYN7) is described in the '107 patent as a spontaneously arising mutant variant of M1 that is capable of "utilizing saccharose and saccharose-bearing substrates, such as molasses, as a source of carbon" and is resistant to both L-threonine and L-homoserine. (DX 15 at col. 4, lines 14-21, 29-31) The strain is auxotrophic for threonine, has a leaky mutation for isoleucine synthesis, and has an amplifiable plasmid containing a chromosomal fragment bearing the threonine operon. (D.I. 307 at 136) The strain also produces 53 g/l of threonine as compared to 20 g/l for VL334(pYN7). (PX 977 at 26-27; JX 1 at col. 11, lines 50-61) It is undisputed that the strains G472T23(pYN7) and M1(pYN7) are different. (D.I. 308 at 319; D.I. 313 at 975)

I. Genetika's Assignment of the '765 Patent to Ajinomoto

84. The rights embodied in the '765 patent were granted to the fourteen named inventors pursuant to the laws of the United States. (PX 2 at 1) Plaintiff asserts that, because the invention was made by the inventors in the course of their employment at Genetika, an institution of the Soviet state, the rights in the '765 patent became the property of the Soviet state. (D.I. 196 at ex. 5 at ¶¶ 24, 26, 27, 40, 44, 62, 103, 108) Ajinomoto did not offer into evidence any assignments of the '765 patent from the named inventors to Genetika or any of its predecessors-in-interest.[27]

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[27] A purported confirmatory assignment from the inventors to Ajinomoto (PX 385), which was filed in the PTO to protect Ajinomoto against subsequent assignments under 35 U.S.C. § 261, was on Ajinomoto's evidence list but was never offered into evidence.

85. On July 21 1982, Ajinomoto entered a license agreement with Licensintorg, the Soviet government's technology licensing entity, granting Ajinomoto the exclusive U.S. rights to the '765 patent. (PX 3; D.I. 311 at 668-69; D.I. 312 at 907-08) The agreement stated that "the Licensor[, Licensintorg,] is entitled by the Author[, Genetika,] to negotiate." (PX 3) Specifically, the agreement granted Ajinomoto the "exclusive right to use the ['765] patent, know-how, technical documentation and strain [G472T23-(pYN7)] for the production, use and/or sale of the licensed product[, L-threonine produced by the method employing G472T23 as developed by Genetika,] in Japan and the U.S. (PX 3 § 2.1(a)) Additionally, Ajinomoto received strain G472T23(pYN7), which had been developed and was owned by Genetika. (PX 3 at 3538, 3562)

86. In 1987, Licensintorg was succeeded by Medexport, another Soviet government agency. (D.I. 311 at 668-89; PX 6; PX 9)) All rights and obligations of Licensintorg under the license agreement were transferred to Medexport. (PX 10)

The license agreement was amended in both December 1989 and December 1990. (PX 6; PX 9) The latter addendum between Ajinomoto and Medexport granted Ajinomoto

> an exclusive right to use the strain E. coli VNIIGenetika 4272T-23, PATENTS, TECHNICAL DOCUMENTATION and KNOW-HOW, concerning this strain to manufacture, use and sell the LICENSED PRODUCT on the base of this strain throughout the whole world except for the [U.S.S.R.], Czechoslovakia, Belgium, Denmark, Finland, Germany, Holland, Iceland, Luxemburg, Norway, Sweden.

(PX 9 § 2(c))

87. In January 1991, all rights and obligations of Medexport under the license agreement and addendums 1 and 2, including the '765 patent, were transferred from Medexport

to Genetika, the legal successor of Medexport. (PX 15; D.I. 311 at 665-71; D.I. 312 at 907-08)

88. Effective May 14, 1991 Genetika assigned and transferred to Ajinomoto "all rights, title and interest" to the '765 patent. (JX 4) In August 1994 this agreement was amended to reflect a change in theroyalty payment. (JX 5)

89. In a memorandum to Genetika concerning the measures to be taken against ADM for alleged infringement, Ajinomoto stated that "there remains a succession certification procedure problem from Licensintorg." (DX 116 at AJ__FRFT008415)

J. Genetika's License of the Strain G472T23 (pYN7) to A.C. Biotechnics

90. **The License.** On or about September 9, 1986, Licensintorg granted a license to use G472T23 to A.C. Biotechnics, ABP International AB's ("ABP") predecessor. (JX 6) This agreement expressly granted ABP "the exclusive right to use the licensed strain, knowledge and patents for the purpose of manufacturing of L-threonine in the territory [—Belgium, Denmark, Finland, FRG, Holland, Iceland, Luxemburg, Norway, and Sweden—] and the non-exclusive right to use and sell L-threonine, thus produced, in the territory and the zone of nonexclusive right[, worldwide but for the U.S.A. and Japan.]" (JX 6 §§ 1.6, 1.5, 2.1) In addition the agreement granted ABP "the right to grant sub-licenses hereunder to third parties limited as said in article 2.1." (JX 6 § 2.4) ABP was required to keep Licensintorg informed of any sub-licenses and the rights assigned to the sublicensees. (JX 6 § 2.4) The agreement also provided that the parties were to "inform each other of all improvements and modifications," made to the licensed strain and that the "terms of transferring such improvements and modifications [were] to be agreed upon between the parties in each separate case," (JX 6 §§ 8.1, 8.2).

91. The Construction of ABP's Strain G472T23 (pYN8). ABP constructed the strain G472T23 (pYN8) from G472T23-(pYN7), which it received from Genetika. ABP used the plasmid pYN7, which had an incomplete (i.e., defective) tetracycline resistant gene, from strain G472T23 in constructing the plasmid pYN8. According to expert testimony and the "owner's manual"[28] (PX 35), ABP isolated the plasmid pYN7 and cut it using restriction endonucleases so as to isolate the chromosomal DNA fragment containing the threonine operon. (D.I. 307 at 165-66; D.I. 313 at 978079) The remaining plasmid DNA, an incomplete copy of pBR322, was removed and discarded and thus was not used to form pYN8. (D.I. 307 at 165-66)

92. According to the genealogy set forth in the record, the feedback resistant threonine operon (mutation in *thrA*) in pYN7 was chromosomal DNA obtained from donor strain MG442. (PX 35 at 2393; PX 966 at 36; D.I. 307 at 126-131) ADM contests this assertion, arguing that the evidence indicates that the descendant pYN7 plasmid differs genetically and structurally from the original pYN7 plasmid and thus the chromosomal fragment found in pYN8 is neither structurally or genetically the same fragment initially isolated from the donor bacterial chromosome. (D.I. 325 at 25-26)

It is undisputed that the strains M1 (pYN7) and G472T23-(pYN7) were not constructed using the method set forth in the '765 patent, but were the result of spontaneously occurring mutations, the number and location of which were unknown. It is also undisputed that each subsequent strain was improved in its ability to produce threonine over the parent strain from which it was derived. Although the plasmid maps depicting the pYN7 plasmid in the '765 patent (JX 1 at Fig. 5), the Russian priority document (PX 2 at 56), the '107 patent (DX 15) and the ABP manual (PX 35 at 2390) all vary with

[28] The manual was provided to ADM by ABP when it purchased the strain.

respect to the size of the plasmid in terms of megadaltons or kilobases, the maps are the same in terms of the restriction sites. (D.I. 308 at 294) Moreover, the maps do not indicate any change in the structure of the threonine operon or its origin. In fact, in its submission to the Japanese Ministry of Agriculture, Forestry and Fisheries, ADM represented that the threonine operon in pYN8 was "*E. coli* chromosome fragments" that were derived from the donor strain MG442. (PX 321 at 2754-55)

93. It is undisputed that the *asd* gene, which catalyzes the second step of threonine synthesis, was not present on the chromosomal fragment used by ABP to construct pYN8. (D.I. 307 at 137-38, 140, 156-57, 159, 161; D.I. 308 at 186, 187-89, 322-24; D.I. 313 at 979-80, 986-87, 943-44)

94. The isolated chromosome fragment from pYN7 was then ligated with plasmid DNA (pBR322) bearing a replacement tetracycline resistant gene and a spacer DNA fragment from plasmid pSGS18. (PX 35 at 2391, 2394; PX 63 at 1655; DX 498) The resultant hybrid plasmid, pYN8, contained an operating ampicillin resistant gene, an operating tetracycline resistant gene, and spacer DNA; the latter two items not being found in pYN7. (PX 35 at 2394; PX 977 at 25) Plasmid pYN8 had a length of 11.5 kilobases (kB), (PX 35 at 2391), as compared to pYN7 which had a length of 10.4 kB, (PX 35 at 2390).

95. The hybrid plasmid, pYN8, was used to transform the host strain, G472T23. According to the ABP manual, plaintiff's expert, and the genealogy presented in the record, G472T23 was a mutant strain of *E. coli* K-12 that was auxotrophic for threonine by a mutation in the *thrC* gene and was partially blocked in threonine metabolism by a mutation in the *ilVA* gene. (PX 35 at 2393, 2396-97; PX 966 at 28-29, 31; D.I. 307 at 151-156) The resultant strain, G472T23-(pYN8), possessed an increased productivity of threonine, producing 80-90 g/l of threonine versus 53 g/l for G472T23-

(pYN7) and 20 g/l for VL334 (pYN7). (JX 1 at col. 11, lines 50-61; PX 966 at 31; PX 977 at 26-28; D.I. 308 at 217, 221; D.I. 307 at 158-60, 162; D.I. 314 at 1128-29, 1145, 1150)

96. ADM contends that the strains it obtained from ABP do not have the *ilvA* leaky mutation as evidenced by the fact that, in order to maximize threonine production, ADM has added isoleucine in one form or another to its threonine seed fermenters since it began the commercial production of threonine. (D.I. 316 at 1472-74) According to the ABP manual, however, the fact that G472T23 has the leaky *ilvA* gene decreases the strain's ability to produce isoleucine and, therefore, there is a need for an addition of isoleucine. (PX 35 at 2396-97) In addition, Mr. Steven F. Stoddard, a group leader in ADM's Research Division, testified that the cells do grow, albeit poorly, without isoleucine present in the medium, indicating that the cells are not isoleucine auxotrophs. (D.I. 312 at 844-45) Moreover, inter-office memoranda indicate that in early 1993, ADM was attempting to make G472T23 prototrophic for both threonine and isoleucine. (PX 76; PX 75)

K. ADM's Search for Threonine-Producing Technology

97. In late 1988, ADM's Robert Dworschack conducted a literature and patent search to identify organizations involved in amino acid research, particularly research dealing with lysine, because ADM intended to enter the amino acid business. (PX 965 at 10-11) During this search, Dworschack became aware of Genetika's amino acid research and its corresponding patents, including a patent of threonine technology. (PX 965 at 11-13)

98. On November 2, 1988, ADM's Jack Reed, John Long, and Dworschack visited the Genetika facilities to inquire about amino acid producing technology, particularly a lysine producing organism. (D.I. 312 at 881) While there, ADM was informed that Genetika had the "world's best organism

for producing threonine." (D.I. 312 at 881) At that time, ADM was not interested in a threonine producing bacterial strain. (D.I. 312 at 882)

99. Also in 1988, ADM began working with Eastman Kodak Company ("Kodak") on developing amino acid technology, particularly lysine, threonine, and tryptophan. (D.I. 312 at 758, 771-74; PX 136; PX 317). In June 1989, ADM entered into an agreement with Kodak whereby it purchased Kodak's technologies. (D.I. 312 at 773-74) The purchase price for the technology was $21 million. (PX 317) At the time of purchase, these technologies were not commercially viable; therefore, work continued on their development. (D.I. 312 at 774) In a subsequent amendment to the June agreement between Kodak and ADM, ADM commissioned Genencor, Kodak's successor, to conduct $1 million worth of research and development for threonine and/or biotin in each of years 1991 and 1992. (PX 142; PX 317) On June 29, 1991, ADM extended the research agreement through December 1991 for approximately $1 million because "the technical breakthrough that [ADM] had hoped for" had not occurred although ADM "continued to be confident that threonine [was] still a commercially viable project." (PX 143; PX 359)

100. On April 25, 1989, ADM publicly announced its plan to enter the commercial amino acid market during the first quarter of 1990, building a new facility in Decatur, Illinois for the manufacture of lysine, tryptophan, and threonine. (PX 131) Subsequently, ADM's start date for the production of tryptophan and threonine was changed to 1991. (PX 140; PX 139)

101. In June 1989, ABP contacted ADM to offer its technology for the industrial fermentation of tryptophan, citric acid, and threonine. (DX 448) ADM did not respond to ABP's invitation to discuss the technologies. (PX 977 at 77-79)

102. In August 1989, ADM commenced construction of its bioproducts facility in Decatur, Illinois. (D.I. 312 at 805-06, 808) By October 1991, the amino acid technology was commercially viable, and ADM began to modify its facilities to begin production of threonine using the Kodak strain. (D.I. 312 at 774, 809-10)

103. On January 30, 1990, ADM's Reed, Dworschack, and Stauffer revisited Genetika's facilities in order to discuss threonine technology. (D.I. 312 at 886-87, 903) At that meeting, Dr. Debabov informed the ADM representatives that Genetika had licensed the threonine producing organism to a Japanese company "which was located somewhere in the middle west of the United States." (D.I. 312 at 888; PX 965 at 37; JX 13 at AD001588-1589) Either at that meeting or shortly thereafter, ADM deduced that the Japanese company was Ajinomoto. (D.I. 312 at 892, 904-06; PX 965 at 37-39)

104. Stauffer and Dworschack had detailed technical discussion with the Genetika representatives. (D.I. 312 at 906) Based on the technical information obtained, Dworschack determined that the Genetika technology should be pursued. (D.I. 312 at 906) ADM suggested to Genetika that it consider having ADM's Russian counsel review the Genetika-Ajinomoto agreement to establish whether Genetika was prohibited from making a threonine organism available to ADM. (D.I. 312 at 909-10) Genetika did not respond to ADM's suggestion until ADM raised the question again later on. (D.I. 312 at 907)

105. Following the trip to Genetika, Stauffer and Dworschack prepared trip reports. In his report to Long, Stauffer stated:

> As you are aware by now, Geneti[k]a has a patent on their *Escherichia coli* strain, and has sold the rights to a Japanese company for exclusive use in the U.S. This contract extends from 1986 to 2003. The company has

> not used the strain to their knowledge. They could not remember the company (this is hard to believe), but said it was located in the midwest.

(JX 12) Stauffer went on to describe the advantages of the Genetika strains. (JX 12)

In his report to Long, Dworschack reported that:

> [Debabov] then proceeded to tell us that an exclusive license to produce threonine only in the United States was given to a Japanese company (no name). . . . Maybe the Japanese are not showing good faith in fulfilling the contract and, as a result, the agreement can be broken.

(JX 13)

106. Subsequently, ADM contacted Degussa, BASF and Genencor to discuss threonine technology. (PX 965 at 27) Nothing came from these discussions. (PX 965 at 27-28)

107. In March 1992, Reed returned to Genetika to establish beyond question whether Genetika was legally prevented by the Genetika-Ajinomoto agreement from providing ADM with the threonine producing organisms. (D.I. 312 at 907; PX 54; PX 976 at 78-83) Genetika asserted that they were unable to furnish ADM such strains, including any "stepping stone" versions thereof, due to its licensing agreement with Ajinomoto. (PX 165) However, Genetika allowed ADM's Russian attorney to review the agreement to determine if Genetika was legally bound by it and thereby prohibited from making a threonine organism available to ADM. (D.I. 312 at 909-10; PX 165; PX 976 at 82) After May 1992, ADM had no further contact with Genetika. (D.I. 312 at 910-11)

L. ADM's Purchase of ABP's Threonine-Producing Technology

108. In January 1992, ABP received the opinion of a Swedish patent agent counsel regarding whether plasmid pYN8 developed by ABP from the Genetika microorganism

was outside the Genetika-ABP agreement. (DX 966) The attorney concluded that, in light of U.S. patent 4,321,325 covering the plasmid pYN7, pYN8 (containing genes for resistance to both ampicillin and tetracycline) could not be used commercially for L-threonine production "all over the world." (DX 966) The attorney went on to opine that if the gene for ampicillin resistance were removed from pYN8 there would be no "obstacle" with respect to the contract or current patent protection. (DX 966) This opinion does not relate to the '765 patent.

109. In June 1992, ABP contacted ADM about ABP's threonine technology. (D.I. 312 at 774-75; PX 976 at 105-08; PX 963 at 30; PX 980 at 31-33; PX 977 at 79-82; JX 7) ABP's offer to ADM included not only the strains, but also "a total operating manual for threonine, which starts with the strains of fermentation process that produced threonine and each of the purification steps." (D.I. 312 at 778-79)

110. ADM was aware of the Genetika patent and that ABP's organisms were derived from the Genetika microorganism when it entered into negotiations with ABP. (PX 976 at 105-08) It is undisputed that at no time prior to or after purchase of the strains from ABP did ADM seek an opinion of counsel regarding infringement of the '765 patent. ADM relied instead on statements made by ABP that it had the right to offer the strains for sale. (PX 964 at 230-31)

111. In November 1992 ADM entered into an agreement with ABP for the acquisition of ABP's threonine technology. (D.I. 312 at 779, 788-89) The purchase price was $3 million. (D.I. 312 at 778-89; PX 36) As part of the agreement, ADM acquired all of ABP's rights to the process for the production of threonine of feed grade quality, the strain process documentation, and the specification of the technical requirements that were to be satisfied in the design and construction of a plant producing threonine using the designated process. (JX 14; D.I. 312 at 778-89; PX 36)

112. The strains purchased by ADM were G472T23-(pYN8) and G472T23(PKYN1108:6), both of which had been developed by ABP.

113. In December 1992, ADM commenced commercial production of threonine at its Decatur plant using G472T23-(pYN8). (PX 921; PX 412) Production with G472T23- continued until approximately September 1994. (PX 412; PX 921)

114. In January 1992, in response to questions posed by ADM regarding the patent-status of G472T23 and G472T23(pYN7), Dr. Harold Skogman, ABP's Managing Director, stated that:

> The strain G472-T23 was derived by inserting Suc^+ into the original VL 334 and selecting for spontan[ ]eous mutants capable of growing on a minimal medium containing threonine (5 mg/ml).
>
> The U.S. patents 4,321,325 and 4,278,765 only mention VL 334 (and VL 334/pYN7) which, as described above, is not the same as G472-T23.

(PX 967 at 2) In addition, ABP reiterated the findings of outside patent counsel that

> the plasmid pYN8, which has both ampicillin and tetracycline resistance would have to be further modified, to be different from pYN7 as described in US Pat[ent] 4,321,325. The Claims of this patent define a plasmid, which gives penicillin resistance. One way to avoid these claims would be to remove the gene for penicillin resistance.

(PX 967 at 3) Skogman stated that ABP was not aware of any patent the Japanese may have obtained on the production of threonine with the Genetika microorganism. (PX 967) Genetika never informed ABP that it had granted an exclusive license to Ajinomoto for threonine production. (PX 977 at 92-93)

115. On January 26, 1993, ADM requested that ABP make further bacterial strains by modifying the ABP plasmid. (PX 39) Specifically, ADM requested the removal of the ampicillin gene from pYN8, leaving the organism resistant to tetracycline only. (PX 39) It was ADM's understanding that "the stability of the modified organism [would] be the same as the unmodified organism and the threonine production and yield [would] be the same." (PX 39)

According to ADM there are benefits to using a strain which is not ampicillin resistant. First, it avoids the potential transfer of ampicillin resistance to other microorganisms. (D.I. 314 at 1133-34; PX 977 at 38-39) Second, the use of ampicillin on an industrial scale can pose health problems. (D.I. 314 at 1133-34) By taking precautions to prevent contamination, ADM reduces the risk posed by a potentially dangerous release. (D.I. 312 at 759-61)

116. In response to ADM's request, ABP constructed two plasmids: pYNSTOP and pYNTE2. To construct pYNSTOP, plasmid pYN8 was subjected to restriction digestion with the restriction enzyme PstI, thereby opening up the pst site in the *amp*^{R} gene. (D.I. 308 at 174-76, 180-81, 197-99; D.I. 313 at 982-83; DX 499; PX 35; PX 63) Then synthetic linker DNA possessing stop codons was inserted to disrupt the ampicillin resistant gene. (D.I. 308 at 174-76, 180- 81, 197-99; D.I. 313 at 982-83; DX 499; PX 35; PX 63) The resultant hybrid plasmid, pYNSTOP, was used to transform the host strain G472T23. (D.I. 308 at 181-82; 218-19, 221; D.I. 314 at 1131, 1150) Unlike G472T23 (pYN8), which has functional *amp*^{R} and *tet*^{R} genes, the bacterial strain G472T23(pYNSTOP) has a functional *tet*^{R} gene but a non-functional *amp*^{R} gene. (D.I. 313 at 982-83; DX 499) In addition, it's yield[29] is 33.7% versus 32.9% for

[29] "Yield" refers to the number of grams of threonine that a strain can produce from 100 grams of dextrose. (D.I. 312 at 830) Because dextrose is an expensive component of the fermentation process, any increase in

G472T23(pYN8), and it accumulates threonine at a rate[30] of 510 lbs/fermenter/hour versus 448 lbs/fermenter/hour for G472T23(pYNB). (D.I. 312 at 831-32; D.I. 316 at 1491)

It is undisputed that pYNSTOP is "different" from pYN8. Dr. Falkinham stated that because pYNSTOP and pYN8 differ with respect to restriction map and size, pYNSTOP is a "different unique plasmid" than pYN8, (D.I. 308 at 317), while Dr. Rudolph found the two plasmids to be "materially different," (D.I. 313 at 984-85).

117. Plasmid pYNTE2 was made by digesting the plasmid pYN8 and isolating the chromosomal DNA fragment containing the feedback resistant threonine operon, followed by the ligation of DNA linkers to the ends of the threonine operon. (D.I. 313 at 985-86; PX 35 at 2394; PX 63 at 1655, 1657-58; DX 500) This chromosomal DNA fragment was then ligated to a DNA fragment with the gene for kanamycin resistance from the plasmid pK3CIC3 to yield the plasmid

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yield results in an increase in profit margin. (D.I. 312 at 834) Because a variety of factors such as the quality of the corn steeped liquor used in the medium, the presence of contaminants, water quality, and operator judgments affect the yield, there is "a lot of noise in the data" and thus a wide variation between runs. (D.I. 316 at 1474-77, 1479)

ADM's expert Julie Davis concluded from her analysis of the data supplied by ADM that the strains used by ADM were comparable in performance. (D.I. 315 at 1324-25)

[30] Rate of threonine accumulation measures the accumulation of threonine in terms of the weight of threonine accumulated per volume over time. Although Genetika used this parameter to compare the performance of M1(pYN7) to VL334(pYN7) in the '325 patent (DX 61 at col. 6, line 38 col. 7, line 12), the record indicates that this parameter was not recorded by ADM or used by ADM to compare fermentation runs; rather the values appear transitorily on an "operator screen" and are used only to determine when it is time to finish a run. (D.I. 316 at 1501-02) Thus, it appears that ADM derived this parameter in the middle of litigation solely for purposes of trial. (D.I. 316 at 1492) This information, therefore, was not relied upon by ADM when comparing the strains during the actual production runs in ADM's facilities. (D.I. 316 at 1492)

pKYN8. (PX 35 at 2394) The plasmid pKYN8 was then cleaved and the chromosomal DNA containing the threonine operon isolated. (D.I. 313 at 985-86; PX 35 at 2394; PX 63 at 1655, 1657-58; DX 500) This chromosomal fragment was then combined with a portion of the plasmid pBR322, from which the *amp*^{R} gene had been removed but which retained the *tet*^{R} gene, to yield the plasmid pYNTE2. (D.I. 313 at 985-86; PX 35 at 2394; PX 63 at 1655, 1657-58; DX 500) This plasmid was used to transform the recipient bacterial strain G472T23. The resultant bacterial strain has a yield of 34.2% to 37.4% and a threonine accumulation rate of 532 lbs/fermenter/hour. (D.I. 312 at 831-32; D.I. 316 at 1491; PX 968 at 32-33) In addition, it has a functional *tet*^{R} gene while completely lacking a gene for ampicillin resistance. (D.I. 313 at 985-86; PX 35 at 2394; PX 63 at 1655, 1657-58; DX 500)

It is undisputed that pYNTE2 is "different" from pYN8. Dr. Falkinham stated that because pYNSTOP and pYN8 differ with respect to restriction map and size, pYNSTOP is a "different unique plasmid" than pYN8 (D.I. 308 at 317), while Dr. Rudolph found the two plasmids to be "materially different" (D.I. 313 at 988).

118. It is also undisputed that the basic utilities, i.e., the over production of threonine, of G472T23(pYN8), G472T23-(pYNSTOP), and G472T23(pYNTE2) are identical. (D.I. 314 at 1132-33, 1144)

119. The microorganisms constructed by ABP in response to ADM's request, G472T23(pYNSTOP) and G472T23-(pYNTE2), were employed by ADM for threonine production from May 1993 until February 1995 and February 1994 until the present, respectively. (PX 921)

Production records indicate that at times the use of the strains in production overlapped. From May 1993 until February 1994, ADM employed both G472T23(pYN8) and G472T23(pYNSTOP). (PX 921) From February 1994 until

September 1994, all three strains were in use. (PX 921) Then in approximately September 1994, ADM ceased production with G472T23(pYN8). In February 1995, production with G472T23(pYNSTOP) ceased. (PX 921) From that time until the present, ADM has employed only G472T23(pYNTE2) in its fermentation runs. (PX 921)

120. A memo dated March 31, 1993 and written by Dr. Paul Hanke, an ADM senior research scientist, indicates that ADM was "working on ways to stabilize the threonine plasmid," including inserting the *serA* gene into the "threonine plasmid." (PX 75) According to the memo, ADM was also trying to develop G472T23 as a host strain for a tryptophan plasmid and as such was attempting to make the strain double prototrophic for both threonine and isoleucine, but at that time had only been able to construct single prototrophic strains. (PX 75) The memo concluded by stating that:

> Either of the single prototrophic strains may be worth testing with the threonine plasmid (pYN8) as they might make the strain clear of the Russian's patent.

(PX 75)

121. In 1993, Dr. Debabov and Mr. Stepanov from Genetika met with Dr. Skogman of ABP. Prior to this meeting, Ajinomoto had informed Genetika that ABP had violated the Genetika-ABP agreement. (DX 1100 at 83-89, 91-92) During the meeting, in response to Dr. Debabov's inquiries, Dr. Skogman reported that ABP had sold "modified" versions of the Genetika microorganism along with the threonine technology. (DX 1100 at 83-89, 91-92; PX 977 at 93-96) Dr. Skogman offered no proof that the strain had been modified. (DX 1100 at 83-89, 91-92; PX 977 at 93-96) Dr. Debabov expressed his displeasure that the technology had been sold without notifying Genetika, but he did not pursue the matter further. (DX 1100 at 83-89; PX 977

at 93-96) Later, Dr. Debabov learned from Ajinomoto that the ABP technology had been sold to ADM. (DX 1100 at 83-89)

122. According to internal communications, Ajinomoto was aware of ADM's activities in the marketplace with respect to the threonine producing organisms acquired by ABP as early as January 1994. (DX 115, DX 116; DX 117; DX 118;DX 120) In fact, a telefax from Contifood AB to Eurolysine dated November 20, 1992 recounted the news report of ABP's sale of threonine technology to ADM. (DX 176) According to defendant, Ajinomoto did not contact ADM regarding its infringement claim until it filed suit in April 1995.

III. CONCLUSIONS OF LAW

A. Standing

1. As a threshold issue, ADM argues that Ajinomoto lacks standing to sue ADM for infringement of the '765 patent because Ajinomoto has failed to establish that it has any ownership rights in the '765 patent. Specifically, ADM avers that Ajinomoto has failed to offer into evidence an assignment of the '765 patent from the named inventors to Genetika or any predecessors-in-interest of Genetika and, therefore, the chain of title from the inventors to Ajinomoto was not established.

2. Standing is a "threshold question in every federal case, determining the power of the court to entertain suit." *Pfizer Inc. v. Elan Pharm. Research Corp.*, 812 F. Supp. 1352, 1356 (D. Del. 1993). The party invoking federal jurisdiction bears the burden of fulfilling the standing requirement. *See Lujan v. Defenders of Wildlife*, 504 U.S. 555, 561 (1992); *Ortho Pharm. Corp. v. Genetics Inst., Inc.*, 52 F.3d 1026, 1032-33 (Fed. Cir. 1995). According to 35 U.S.C. § 281, a civil action for infringement may be brought by a "patentee," 35

U.S.C. § 281 (1997), which is defined to "include[] not only the patentee to whom the patent was issued but also the successors in title to the patentee," 35 U.S.C. § 100(d). Pursuant to 35 U.S.C. § 261, patents, and any interests therein, are "assignable in law by an instrument in writing." 35 U.S.C. § 261. An assignee of the rights under a patent is deemed the effective "patentee" under § 281 and has standing to bring suit in its own name for infringement. *See Ortho Pharm. Corp.*, 52 F.3d at 1030. Thus, if Ajinomoto can prove that it was the assignee of the '765 patent at the time suit was filed, Ajinomoto has standing to sue for patent infringement. *See GAIA Technologies, Inc. v. Reconversion Technologies, Inc.*, 93 F.3d 774, 777 (Fed. Cir. 1996). Absent ownership of the '765 patent, Ajinomoto lacks standing to sue on the patent. *See id.*

3. Rather than raise the issue at an earlier stage of the proceedings, ADM has raised the issue of standing for the first time in its post-trial brief. Although ADM denied in its answer to the complaint that Ajinomoto was the owner of the '765 patent (ADM was "without knowledge or information sufficient to form a belief," (D.I. 8)) and refused to add to the statement of admitted facts that "Ajinomoto is the owner of the '765 patent," Ajinomoto's standing was never specifically raised as an issue to be decided in the pretrial order. Thus, neither Ajinomoto nor the court was sufficiently put on notice that standing was a contested issue. This delay effectively prevented Ajinomoto from offering into evidence the pertinent provisions of Soviet law or the purported assignment to Ajinomoto by the inventors that is recorded in the PTO.

4. Nevertheless, the chain of title evidenced by the record is sufficient to confer standing on Ajinomoto. It is undisputed that the invention was made by the inventors in the course of

their employment at Genetika, a Soviet institution. (¶ 8)[31] Therefore, even though the Inventors' Certificate[32] was issued in the names of the inventors, according to Soviet law, the invention became the property of the Soviet government. (D.I. 196, Ex. 5 at ¶¶ 24, 26;[33] *see also* Baev, *supra*, at 366-69; Pisarenko & Goldstein, *supra*, at 171-72; Pitta, *supra*, at 325-26) Soviet law also dictated that "patenting (legal protection) of the Soviet inventions abroad [and] selling of licenses for the Soviet inventions" was to be controlled by the Soviet government through the appointed enterprise, organization, or institution. (D.I. 196, Ex. 5 at ¶¶ 103, 105-06; *see also* Baev, *supra*, at 366-69; Pisarenko & Goldstein, *supra*, at 171-72; Pitta, *supra*, at 325-26) Given the absence of exclusive property rights and private ownership of property in the former Soviet Union at the time the '765 patent issued, it can hardly be questioned that the '765 patent was the property of the Soviet government despite the fact that the patent was issued in the name of the inventors. *See, e.g., United States v. Pink*, 315 U.S. 203 (1942) (discussing the nationalization of the business, funds, and property of Russian insurance companies); *Tillman v. United States*, 320 F.2d 396 (Ct. Cl. 1963) (discussing

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[31] **The indicated paragraphs refer to Part I, Findings of Fact.**

[32] Although Soviet law in 1978 provided for patent protection, the dominant means of protecting intellectual property rights of inventors was an Inventor's Certificate. *See* Andrew A Baev, *Recent Changes in Russian Intellectual Property Law and Their Effect Upon the Protection of Intellectual Property Rights in Russia*, 19 Suffolk Transnat'l L. Rev. 361, 366-69 (1996); Anatiliy P. Pisarenko & Steven J. Goldstein, *The Intellectual Property Laws of Ukraine*, 78 J. Pat. & Trademark Off. Soc'y 149, 171-72 (1996); Laura A. Pitta, *Comment, Strengthening the Legal Basis of Perestroika: The U.S.S.R. Draft Laws on Inventive Property*, 7 Santa Clara Computer & High Tech. L.J. 321, 325-26 (1991). In the case of employee inventions, only an Inventor's Certificate could be issued. (D.I. 196, Ex. 5 at ¶ 24; *see also* Baev, *supra*, at 368)

[33] "The exclusive right of the State to an invention shall have a duration of 15 years from the filing date of the application."

nationalization of all banks in Russia); *Salimoff v. Standard Oil Co.*, 186 N.E. 679 (N.Y. 1933) (discussing nationalization of oil reserves in Russia). Thus, evidence of an assignment from the named inventors to Genetika or its predecessors is not necessary. Consequently, the chain of title evidenced in the record is complete. (¶¶ 84-88) Because Ajinomoto has demonstrated sufficiently that it is the assignee of the '765 patent, it rightfully has standing to sue ADM for infringement of the '765 patent. Accordingly, ADM's post-trial attempt to dismiss the action fails.

B. Infringement

5. Ajinomoto contends that ADM's importation of strains G472T23(pYNB), G472T23(pYNSTOP), and G472T23-(pYNTE2) into the United States infringes Ajinomoto's patent rights because ABP's process of making the strains literally infringes claims 1 and 2 of the '765 patent. Ajinomoto's claim is based upon 35 U.S.C. § 271(g) which provides:

> Whoever without authority imports into the United States or offers to sell, sells, or uses within the United States a product which is made by a process patented in the United States shall be liable as an infringer, if the importation, offer to sell, sale, or use of the product occurs during the term of such process patent. . . . A product which is made by a patented process will, for purposes of this title, not be considered to be so made after—
>
> (1) it is materially changed by subsequent processes; or
>
> (2) it becomes a trivial and nonessential component of another product.

35 U.S.C. § 271(g). Under 271(g) it is Ajinomoto's burden to demonstrate, *inter alia*, that (1) ABP's strains were produced according to the '765 process; and (2) ADM

imported the strains into the United States.[34] *See Nova Nordisk of North America, Inc. v. Genentech, Inc.*, 77 F.3d 1364, 1367-68; *cf. Eli Lilly & Co. v. American Cyanimid Co.*, 896 F. Supp. 851, 855-56 (S.D. Ind. 1995) (also requiring the patentee to demonstrate, if the products were produced pursuant to the patent process, that they were not materially changed by subsequent processes).

6. The Federal Circuit has set forth a two-step analysis for determining whether a patent claim is infringed:

> "First, the claim must be properly construed to determine its scope and meaning. Second, the claim as properly construed must be compared to the accused device or process."

Novo Nordisk of North America, Inc., 77 F.3d at 1368 (quoting *Carroll Touch. Inc. v. Electro Mechanical Sys.*, 15 F.3d 1573, 1576 (Fed. Cir. 1993).

1. Claim Construction

7. It is the court's "power and obligation to construe as a matter of law the meaning of language used in the patent claim." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995), aff'd, 116 S.Ct. 1384 (1996). Courts are directed to consider three sources to ascertain the meaning of a claim: The literal language of the claim, the patent specification, and the prosecution history. When interpreting the words of the claim, the court should "ascribe [to the words] their ordinary meaning unless it appears the inventor used them otherwise." *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995). The words of the claim must be construed in the light of the specification, whose "description may act as a sort of

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[34] The court already has found that "ADM clearly has imported, sold and/or used the products at issue in the United States without authority." (D.I. 272 at 25 n.13)

dictionary, which explains the invention and may define terms used in the claims." *Markman*, 52 F.3d at 979. The court should also consider the patent's prosecution history, as it constitutes an "undisputed public . . ." expression of what the patentee understood in terms of claim construction. *Id.* at 980. The court may, in its discretion, consider extrinsic evidence "to assist in its construction of the written document, a task it is required to perform." *Id.* at 981. "Extrinsic evidence consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises." *Id.* at 980. Neither the patent's prosecution history nor any extrinsic evidence considered can "enlarge, diminish, or vary" the limitations in the claims. *Id.*

8. **"Genes controlling the synthesis of a selected aminoacid."** The parties dispute the meaning of the phrase "genes controlling the synthesis of a selected aminoacid" which appears in claim 1 of the '765 patent. Claim 1 requires the chromosome DNA fragment of the donor bacterium that is to be used to form the hybrid plasmid to contain "genes controlling the synthesis of a selected aminoacid." ADM argues that the phrase should be construed to mean **all** genes controlling the synthesis of a selected amino acid, and that ABP's strains do not literally infringe claim 1 because ABP's plasmids do not carry the *asd* gene. According to ADM's construction, the threonine operon would not satisfy the claims and, thus, the threonine producing *E. coli* described in the specification do not fall within the scope of claim 1. Ajinomoto takes the position that the phrase "genes controlling the synthesis of a selected aminoacid" and the term "operon" are equivalent.

9. ADM supports its position that the phrase "genes controlling the synthesis of a selected aminoacid" should be construed to include all genes controlling the synthesis of a selected amino acid by reference to the '765 patent

specification, the claims, and expert testimony. The '765 patent specification states:

> For further work in constructing the strain producing an aminoacid use is made of hybrid plasmids containing **all** the selected genes controlling the synthesis of the given aminoacid. In this case, if the isolated plasmids do not contain **all the required genes,** the above-mentioned operations are repeated by modifying the fragmentation of DNA, e.g., by using another specific endonuclease.

(JX 1 at col. 5, lines 21-28) (emphasis added). Claim 1 of the '765 patent uses the phrase "genes controlling the synthesis of a selected aminoacid," (JX 1 at col. 12, line 5), whereas claims 3 and 4 refer to the threonine operon, (JX 1 at col. 12, lines 28-29, 45-46). ADM points out that operons do not invariably contain all the genes controlling the synthesis of an amino acid, and not all species have genes controlling the synthesis of any particular amino acid which are organized as an operon. (¶ 59)

10. Ajinomoto seeks to interpret the phrase as meaning the operon. The term "operon" is defined in the '765 patent as "a jointly controlled group of genes generally monitoring the synthesis of a single product, e.g. aminoacid." (JX 1 at col. 1, lines 49-51) In supporting its position, Ajinomoto argues that the threonine operon is encompassed in the phrase "genes controlling the synthesis of a selected aminoacid" because the operon controls the synthesis of threonine. In the examples set forth in the '765 patent and ABP's construct, once a plasmid that contained the threonine operon was inserted into an auxotrophic host, the strain was able to produce threonine. Dr. Falkinham testified that "[i]n using the word operon, we would also include those genes involved in the regulation of expression of the—those—genes for threonine synthesis." (D.I. 308 at 322) On cross examination, Dr. Rudolph agreed that "in the ordinary course of business that we call the

science of microbiology, when one refers to the genes controlling the synthesis of the selected amino acid, they refer to in the fashion you have with regard to Tribe . . . the structural genes that are involved in the expression of that aminoacid." (D.I. 317 at 1649)

11. Neither Ajinomoto nor ADM introduced specific evidence regarding the use of the term "operon" and the phrase "genes controlling the synthesis of a selected aminoacid" by one skilled in the art at the time of the invention.

12. Based on this evidence and the specification, the court concludes that the phrase "genes controlling the synthesis of a selected aminoacid" refers to the amino acid operon.

2. Comparison of the Claims to the Accused Strains

13. Claim 1 of the '765 patent describes a method whereby a chromosome DNA fragment of a donor bacterial strain containing the genes for the production of the selected amino acid which has a mutation destroying the negative regulation of the amino acid is combined with an amplifiable plasmid DNA molecule to form a hybrid DNA molecule, followed by transformation into a recipient bacterial strain having a mutation blocking the synthesis of the amino acid and a mutation partly blocking a related step of the metabolism of the amino acid. (¶ 30) Based on the findings of fact and the court's claim construction, ABP's process of constructing strains G472T23(pYN8), G472T23(pYNSTOP), and G472T23(pYNTE2) falls within the literal scope of claim 1 of the '765 patent. All of these strains were constructed by combining a chromosome DNA fragment having the required characteristics,[35] said fragment originally obtained from

[35] Although at trial ADM continued to argue that the term "chromosome DNA fragment of a donor bacterium" should not be interpreted to include DNA fragments from plasmids or bacteriophages,

MG422, with an amplifiable plasmid pBR322 or a portion thereof, to form a hybrid plasmid which was then used to transform a host strain (G472T23) that was auxotrophic for threonine and was partially blocked in threonine metabolism by a mutation in the *ilvA* gene. (¶¶ 91-96, 116-117) Although the construction of plasmids pYNSTOP and pYNTE2 require additional steps (¶¶ 116-117), infringement is not avoided given the open claim language of claim 1. The resultant bacterial strains all possessed increased productivity of threonine as required by claim 1. (¶¶ 95, 116-117)

14. Claim 2 sets forth a method as claimed in claim 1 whereby prior to transformation, ballast genetic material[36] is removed from the hybrid plasmid. (¶ 31) Based on the findings of fact, the court concludes that the plasmids at issue were constructed using the method set forth in claim 2. In constructing pYN8, ABP subjected plasmid pYN7 to restriction digestion and removed and discarded an incomplete copy of pBR322, replacing it with a complete version of the plasmid and spacer DNA from plasmid pSGS18. (¶¶ 91, 94) Although the resultant plasmid, pYN8, is larger than pYN7, claim 2 does not require that the resulting hybrid plasmid be reduced in size. (¶¶ 29, 31, 94) Moreover, if the incomplete copy of pBR322 had not been removed, the resultant plasmid would have contained two copies of pBR322. Thus, prior to transformation, ABP removed from pYN7 ballast genetic material. Since pYNSTOP is the product of an additional step in the construction of pYN8, its construction also used the method set forth in claim 2. (¶ 116) Finally, in constructing pYNTE2, unwanted genetic material from plasmid pKYN8 was removed and subsequently replaced with a portion of plasmid pBR322. (¶ 117) Thus, the construction of all three strains

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the court is not persuaded that a change in its prior interpretation (D.I. 289 at ¶ 1) is warranted.

[36] Ballast genetic material being unwanted, unneeded DNA. (¶ 31)

involved the removal of ballast genetic material from the hybrid plasmid prior to transformation.

15. ADM asserts that, even if strain G472T23(pYN8) was constructed using a process covered by claims 1 and 2 of the '765 patent, strains G472T23(pYNSTOP) and G472T23-(pYNTE2) are materially changed from G472T23(pYN8) and thus their importation into the United States would not be an act of infringement under 35 U.S.C. § 271(g). The issue of material change arises only when "[a] product which is made by a patented process . . . is materially changed by **subsequent** processes." 35 U.S.C. § 271(g) (emphasis added); *Eli Lilly & Co. v. American Cyanamid Co.*, 82 F.3d 1568, 1577 (Fed. Cir. 1996) ("A product will be considered to have been made by a patented process if the additional processing steps which are **not covered by the patent** do not change the physical or chemical properties of the product in a manner which changes the basic utility of the product [produced] by the patented process.") (emphasis added) (quoting S. Rep. No. 83, 100th Cong., 1st Sess. 50 (1987)). In order for a product to be considered materially changed, there must be "a real difference between the product imported, offered for sale, sold, or used in the United States and the products produced by the patented process." *Bio-Technology General Corp. v. Genentech, Inc.*, 80 F.3d 1553, 1560 (Fed. Cir. 1996). Modification of the product of a patented process does not constitute material change if the process claim encompasses both the unmodified and modified product forms. *See id.*

16. ADM's argument is based on the assumption that strain G472T23(pYN8) is the only strain which is made by the '765 patent claimed process. However, the court has already determined that strains G472T23(pYNSTOP) and G472T23-(pYNTE2) were also constructed using the method set forth in claims 1 and 2 of the '765 patent. There is no evidence indicating that, following their construction, strains G472T23-(pYNSTOP) and G472T23(pYNTE2) were modi-

fied by any subsequent processes prior to importation. Therefore, ADM "cannot maintain that the 'materially changed' exception to infringement applies, because the product[s; i.e., strains G472T23(pYNSTOP) and G472T23-(pYNTE2),] made by the patented process [are] not changed at all, let alone 'materially changed.'" *Id.* Accordingly, the court concludes that strains G472T23(pYN8), G472T23-(pYNSTOP), and G472T23(pYNTE2) infringe claims 1 and 2 of the '765 patent.

C. Validity

17. "A patent is presumed valid, and the burden of proving invalidity, whether under § 112 or otherwise, rests with the challenger. Invalidity must be proven by facts supported by clear and convincing evidence." *United States v. Telectronics, Inc.*, 857 F.2d 778, 785 (Fed. Cir. 1988). The issues of enablement and obviousness are questions of law; however, a determination of enablement or obviousness is based on factual inquiries. *See, e.g., In re Good*man, 11 F.3d 1046, 1049-50 (Fed. Cir. 1993); *B.F. Goodrich Co. v. Aircraft Braking Systems Corp.*, 72 F.3d 1577, 1582 (Fed. Cir. 1996).

1. 35 U.S.C. § 103—Obviousness

18. ADM contends that claims 1 and 2 of the '765 patent are invalid for obviousness under 35 U.S.C. § 103. Specifically, ADM argues that (1) the combined teachings of Tribe and Kozlov readily suggest the method set forth in claim 1; (2) the teachings of Kozlov with respect to transformation and selection in combination with the Genetika articles, which disclose the donor and recipient strains, render claim 1 obvious; and (3) the removal of ballast genetic material as required by claim 2 is taught by Clarke/Carbon and one skilled in the art would be motivated to apply these teachings to the Tribe, Kozlov, and Genetika teachings.

19. A patent is invalid under 35 U.S.C. § 103

> if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Obviousness under § 103 is a legal conclusion based on several factual inquiries: "(1) the scope and content of the prior art; (2) the differences between the claims and the prior art; (3) the level of ordinary skill in the pertinent art; and (4) secondary considerations, if any, of nonobviousness." *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1050 (Fed. Cir. 1988), *aff'd in part vacated in part*, 939 F.2d 1540 (Fed. Cir. 1991). Secondary considerations include "evidence of factors tending to show nonobviousness, such as commercial success of the invention, satisfying a long-felt need, failure of others to find a solution to the problem at hand, and copying of the invention by others." *B.F. Goodrich Co.*, 72 F.3d at 1582. "[T]he burden of showing, by clear and convincing evidence, the invalidity of [patent claims] is especially difficult when the prior art was before the PTO examiner during the prosecution of the application." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1467 (Fed. Cir. 1990) However, where there is "no PTO view . . . on obviousness in view of [the asserted] references[,] the burden of proof . . . is more easily carried." *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 905 (Fed. Cir. 1985). Nevertheless, the burden of proof on invalidity remains with the party challenging the patent. *See Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1375 (Fed. Cir. 1986); *American Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1358 (Fed. Cir. 1984).

20. It is undisputed that none of the prior art publications standing alone renders the teachings of the '765 patent obvious. Nevertheless, ADM argues that when viewed

together, all of the elements of claims 1 and 2 are found. When obviousness is based on prior art references, "there must be a showing of a suggestion or motivation to modify the teachings" of those references. *B.F. Goodrich Co.*, 72 F.3d at 1582. This suggestion to modify the art need not be expressly stated in the references, " '[r]ather the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.'" *Cable Elec. Prods., Inc. v. Genmark, Inc.*, 770 F.2d 1015, 1025 (Fed. Dir. 1985) (quoting *In re Keller*, 642 F.2d 413, 425 (C.C.P.A. 1981)). Hindsight reconstruction and/or "the blueprint drawn by the inventor," *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1138 (Fed. Cir. 1985), may not be used "to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention," *In re Fine*, 837 F.2d 1071, 1075 (Fed. Cir. 1988). "[T]he question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" *In re Beattie*, 974 F.2d 1309, 1311 (Fed. Cir. 1992 (quoting *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1462 (Fed. Cir. 1984)). Accord *In re Fine*, 837 F.2d at 1074-75; *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577 (Fed. Cir. 1984).

21. **Scope and Content of the Prior Art.** A threshold question is whether any or all of the publications identified by ADM should be characterized as "prior art." Prior art has been defined as "knowledge that is available, including what would be obvious from it, at a given time, to a person of ordinary skill in an art." *Kimberly-Clark Corp. v. Johnson & Johnson*, 745 F.2d 1437, 1453 (Fed. Cir. 1984). The claims of the '765 patent are directed to a method for the construction of genetically engineered bacterial strains possessing an enhanced capacity of producing selected amino acids without the need for additional growth factors. All of the references

identified by ADM are within the field of microbial genetics, "the field of the inventor[s'] endeavor." *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 449 (Fed. Cir. 1986). It is undisputed that the Kozlov article and the Clarke/Carbon article are prior art, and the court has already concluded (D.I. 272 at 45) that the Genetika articles are prior art. Thus, the only remaining issue is whether the Tribe thesis was "'sufficiently available to the public interested in the art,'" *In re Cronyn*, 890 F.2d 1158, 1160 (Fed. Cir. 1989) (quoting *Constant v. Advanced MicroDevices, Inc.*, 848 F.2d 1560, 1568 (Fed. Cir. 1988)), "more than one year prior to the [priority] date," 35 U.S.C. 102(b). It is ADM's burden to prove by clear and convincing evidence that the Tribe thesis was in fact prior art to the '765 patent. *See RCA Corp. v. Data General Corp.*, 701 F.Supp. 456, 468 (D. Del. 1988), *aff'd*, 887 F.2d 1056 (Fed. Cir. 1989); *Mannesmann Demag Corp. v. Engineered Metal Prods. Co., Inc.*, 605 F. Supp. 1362, 1367 (D. Del. 1985), *aff'd*, 793 f.2d 1279 (Fed. Cir. 1986).

22. The test for determining whether a prior art reference was publicly available is whether

> 'it has been disseminated or otherwise made available to the extent that persons interested and of ordinary skill in the subject matter or art [ ] exercising reasonable diligence can locate it. . . .'

Massachusetts Institute of Technology v. AB Fortia, 774 F.2d 1104, 1109 (Fed. Cir. 1985) (quoting *In re Wyer*, 655 F.2d 221, 226 (C.C.P.A.1981)). Although the determination of "public accessibility" is to made on a case-by-case basis, *see In re Hall*, 781 F.2d 897, 899 (Fed. Cir. 1986), certain guidelines have emerged. The requirement may be met by distributing or making the paper available at a conference where members of the interested public were "told of the paper's existence and informed of its contents." *See Massachusetts Institute of Technology*, 774 F.2d at 1109. Cataloging and shelving of a doctoral thesis in a university

library that is readily accessible to those interested in the art also satisfies the standard. *See In re Hall*, 781 F.2d at 899 (finding a doctoral thesis catalogued in a university library, easily accessible to the interested public, a "printed publication"). However, limited distribution, even to those skilled in the art, does not amount to public accessibility. Thus, distribution of a master's thesis to three members of a faculty committee responsible for assessing the student's entitlement to a degree, accompanied by "depositing the thesis in the university library where it remained uncatalogued and unshelved as of the critical date," did not satisfy the standard. *In re Bayer*, 568 F.2d 1357, 1362 (C.C.P.A. 1978). Likewise, titles of theses listed on cards filed alphabetically by author in a shoebox in the chemistry department were not catalogued or indexed in a sufficiently "meaningful way" to make them reasonably accessible to the public. *In re Cronyn*, 890 F.2d at 1161. It is irrelevant to the public accessibility determination whether "members of the public actually received the information." *Constant*, 848 F.2d at 1569.

23. The key to determining whether the Tribe thesis was publicly available is whether the thesis was indexed, cataloged, and shelved on the critical date. *See In re Cronyn*, 890 F.2d at 1161. In the absence of evidence establishing a specific date of cataloging and shelving, "**competent evidence** of general library practice may be relied upon to establish an approximate time when a thesis became accessible." *In re Hall*, 781 F.2d at 899 (emphasis added). In the present case, ADM relied entirely on the testimony of Dr. Tribe to prove that the thesis was prior art.[37] However, Dr. Tribe had no actual first-hand knowledge of the procedures employed by the university libraries, being a doctoral candidate not a member of the library personnel.

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[37] Although ADM submitted a date-stamped copy of the Tribe thesis into evidence, the significance of the date stamped was based entirely on the testimony of Dr. Tribe.

(¶ 33) Moreover, he was not present at the university for most of the 1977 to 1978 period; consequently, he admitted there were "many details of the cataloging with which [he] would not be familiar." (¶ 36) Thus, his testimony is speculative and not probative of general indexing, cataloging, and shelving procedures at the University of Melbourne libraries at issue. *Cf. In re Hall*, 781 F.2d at 899 (relying on the affidavit of the director and manager of the Loan Department of the Library of Freiburg University with respect to general library procedures in estimating the time it would have taken to make the dissertation available to the interested public). Although a single cataloged copy of a thesis in a foreign university library is sufficient under 35 U.S.C. § 102(b), *see id.* at 900, ADM has not established by clear and convincing evidence that the Tribe thesis was in fact catalogued and shelved by the critical date in question.

24. ADM also asserts that Dr. Tribe's three presentations of his doctoral research in the United States prior to June 30, 1978, as well as the submission of his thesis to Dr. Demane at M.I.T. in 1977, made Tribe's work public knowledge in the United States as prior art under 35 U.S.C. § 102(a), and corroborate the public availability of the Tribe thesis under § 102(b). However, the case defendant cites in support of its assertion, *Massachusetts Institute of Technology v. AB Fortia*, 774 F.2d 1104 (Fed. Cir. 1985), is inapposite. In *Massachusetts Institute of Technology*, the court found that a paper delivered at a conference attended by between 50 and 500 persons interested and skilled in the art, copies of which were distributed without restriction to at least six persons, constituted a "printed publication" under 35 U.S.C. § 102. *See id.* at 1109. In the present case, however, there is no indication that Dr. Tribe distributed copies of his thesis at the presentations. The record is also devoid of any evidence delineating the content of Dr. Tribe's presentations except for

vague generalizations.[38] (¶ 37) Because it is not clear whether the relevant information contained in the Tribe thesis was disseminated during the presentations, the court cannot conclude that the "invention was known" as required under § 102(a). Moreover, the limited distribution of the thesis to Dr. Demane, a member of the committee responsible for assessing Dr. Tribe's work, does not amount to public knowledge and/or availability. *See In re Bayer*, 568 at 1362. Accordingly, the court concludes ADM has not established by clear and convincing evidence that the Tribe thesis is prior art to the '765 patent.

25. **The Differences Between the Claims and the Prior Art.** Once the prior art is identified, the focus of the analysis centers on the differences between the claimed invention and the prior art. *See Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 1345 (Fed. Cir. 1984); *Ryko Mfg. Co. v. Nu- Star, Inc.*, 950 F.2d 714, 717 (Fed. Cir. 1991) ("When analyzing a patent claim for obviousness, the claim should be considered as a whole, but the [principal] differences between the [patented] claim and the prior art need to be identified."). The analysis centers on the ultimate legal question, "whether these differences are such that the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made." *TEC Systems, Inc.*, 725 F.2d at 1345.

26. Since the court has determined that the Tribe thesis does not constitute prior art, the question in the case at bar is whether the teachings of the Kozlov article when considered with the teachings of the Genetika references and the Clarke/Carbon article show each and every element required by claims 1 and 2 and suggest the reasonableness of their combination. Based on the findings of facts, the court concludes that the Genetika references in combination with the Kozlov article do not render claim 1 obvious. (¶¶ 46-47,

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[38] The same is true with respect to the non-U.S. presentations of his research. (¶ 38)

49-50) The Kozlov reference teaches a method for isolating and amplifying specific chromosomal markers. (¶ 46) It does not teach: (1) the use of a chromosomal DNA fragment having the required characteristics; and (2) a recipient strain having a mutation blocking the related step of metabolism of the selected amino acid. (¶ 47) These deficiencies are not cured by the Genetika references, which merely describe the donor and recipient strains used in the examples disclosed in the specification of the '765 patent. (¶ 49) Likewise, the isolated statement in the last paragraph of the Clarke/Carbon article, which suggests that hybrid plasmids can be made smaller by endonuclease digestion (¶ 53), does not provide the guidance necessary to render the ballast removal step of claim 2 obvious. Moreover, there is no evidence indicating that one skilled in the art would be motivated to combine these references to achieve the claimed invention. The fact that the references all deal with *E. coli* containing hybrid plasmids does not sufficiently "'suggest the desirability, and thus the obviousness, of making the combination'" as required. *In re Beattie*, 974 F.2d at 1311 (quoting *Lindemann Maschinenfabrik*, 730 F.2d at 1462).

27. Even if the Tribe thesis were considered prior art, the '765 patent still would not be rendered obvious to one of skill in the art at the time of the invention. ADM asserts that the motivation to combine the Tribe thesis and the Kozlov reference lies in the Tribe thesis itself, which suggests the use of high copy number or relaxed plasmids to amplify the amino acid genes. (¶ 39) However, isolated statements in a 193 page dissertation that discusses a technique employing a stringent plasmid does not constitute proof of motivation to combine. *See In re Fine*, 837 F.2d at 1075; *Interconnect Planning Corp.*, 774 F.2d at 1138. This is particularly true where the focus of the two references differs (¶¶ 39, 46) and one reference in several instances teaches away from the claimed invention (¶¶ 39-43). *See In re Gurley*, 27 F.3d 551,

553 (Fed. Cir. 1994); *In re Bell*, 991 F.2d at 785; *Bausch & Lomb, Inc.*, 796 F.2d at 448. Such reliance on selected statements in the prior art to suggest the combination of the asserted references constitutes nothing more than hindsight reconstruction and, as such, cannot establish obviousness.

28. Even assuming arguendo that motivation to combine the references existed, the Tribe thesis in combination with the Kozlov article does not teach the process set forth in claim 1 of the '765 patent. The deficiencies in the Kozlov article (¶ 47) are not cured by the Tribe thesis. In particular, the combined disclosures of Tribe and Kozlov do not teach the recipient strain called for by claim 1. (¶ 43, 47) Thus, the teachings of Tribe and Kozlov do not provide the motivation and guidance to combine their teachings so as to render claim 1 obvious.

29. **The Level of Ordinary Skill in the Pertinent Art.** There are six factors a court should consider in determining the level of ordinary skill in the art: (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) the prior art solutions; (4) the rapidity of innovation; (5) the sophistication of the technology at issue; and (6) the educational level of active workers in the field. *See Bausch & Lomb, Inc.*, 796 F.2d at 449-50. In accordance with the court's prior determination, for purposes of this action,

> the person of ordinary skill in the art as of June 30, 1978 would have had a Ph.D. in microbial genetics, with at least three years or more of post-doctoral experience. This person would have had experience in biochemistry and molecular genetics, and would have been aware of microbial recombinant DNA technology *in vivo* and *in vitro*.

(D.I. 274 at 43 n. 17)

30. **Secondary Considerations.** Objective indicia of non-obviousness must be considered before a conclusion on

obviousness can be made. *See Hybritech*, 802 F.2d at 1380; *Cable Elec. Prods., Inc.*, 770 F.2d at 1026 (Secondary considerations must be considered "always, 'not just when the decisionmaker remains in doubt after reviewing the art.'" (quoting *Stratoflex, Inc. v. Acroquip Corp.*, 713 F.2d 1530, 1539 (Fed. Cir. 1983)). In the instant action, the secondary considerations provide support for a finding that ADM has failed to carry its burden. For a number of years, ADM sought the best threonine-producing bacterial strain. (¶¶ 97-111) Although ADM contends that it was content to go forward with commercial production using the Kodak strain, the record indicates that between January 1990 and May 1992 ADM repeatedly attempted to obtain the '765 patent technology, which Dr. Stauffer had praised, from Genetika. (¶¶ 98, 103-105, 107) Only after ADM realized it could not obtain the Genetika technology did it agree to purchase ABP's threonine technology, which ADM knew to be derived from the Genetika microorganism. (¶¶ 110-111) Thus, despite the fact that the strains specifically identified in the '765 patent had never been used commercially, ADM continued to seek the Genetika technology. (¶¶ 103-105, 107, 110-111) "ADM's quest to purchase the '765 technology in light of the failure of alternative threonine-producing technologies," (D.I. 274 at 46 n. 21), is indicative of the nonobviousness of the claimed invention.

31. In light of the test set out in *Graham*, the court concludes, after examining the prior art and secondary considerations of nonobviousness, that ADM has failed to prove by clear and convincing evidence that the '765 patent is invalid on obviousness grounds. The claimed invention is several steps removed from the information presented by the prior art references.

2. 35 U.S.C. § 112—Best Mode and Enablement.

32. ADM also contends that the '765 patent is invalid under 35 U.S.C. § 112. Specifically, ADM argues that: (1) the

'765 patent does not disclose the best mode; (2) the '765 patent fails to enable the full scope of generic claims 1 and 2; and (3) the inventors failed to deposit the requisite strains in a manner that made them freely available to the public as required by the PTO. The court will address ADM's arguments *in seriatim*.

33. **Best Mode.** ADM argues that the inventors knowingly failed to disclose the best mode of practicing the '765 claimed invention because they did not explicitly set forth in the specification that, in order to achieve increased threonine production, the recipient strain was required to carry the *relA*$^+$ gene. Section 112 provides in relevant part that "[t]he specification . . . shall set forth the best mode contemplated by the inventor of carrying out his invention." 35 U.S.C. § 112. The Federal Circuit has described the best mode requirement as having two components:

> The first is a subjective one, asking whether, at the time the inventor filed his patent application, he contemplated a best mode of practicing his invention. If he did, the second inquiry is whether his disclosure is adequate to enable one skilled in the art to practice the best mode or, in other words, whether the best mode has been concealed from the public. . . . Our case law has interpreted the best mode requirement to mean that there must be no concealment of a mode known by the inventor to be better than that which is disclosed.

Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd., 927 F.2d 1200, 1209-10 (Fed. Cir. 1991). "[S]pecific intent to deceive is not a required element of the best mode defense." *Graco, Inc. v. Binks Mfg. Co.*, 60 F.3d 785, 789-90 (Fed. Cir. 1995). Any concealment of the best mode, whether accidental or intentional, is a violation of the best mode requirement. *See Dana Corp. v. IPC Ltd. Partnership*, 860 F.2d 415, 418 (Fed. Cir. 1988); *Spectra-Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 1535 (Fed. Cir. 1987); *In re Sherwood*, 613 F.2d 809,

816 (C.C.P.A. 1980). *Cf. Brooktree Corp. v. Advanced Micro Devices, Inc.*, 977 F.2d 1555, 1575 (Fed. Cir. 1992) ("Invalidity for violation of the best mode requires intentional concealment of a better mode than was disclosed.") (citation omitted).

34. The court has already recognized that "the best mode of practicing the '765 invention requires that the bacterial host be characterized by the presence of the *relA*$^+$ gene." (D.I. 274 at 42) It is undisputed that at the time the '765 patent application was filed, the inventors knew that the operons controlling threonine and isoleucine synthesis were positively regulated by the product of the *relA*$^+$ gene. (¶ 76) Thus, the only remaining question is whether one skilled in the art at the time of the invention would recognize the importance of the *relA*$^+$ gene from the specification. It is ADM's burden to prove by clear and convincing evidence that the '765 patent is invalid for failure to disclose the best mode of practicing the invention. *See Engel Indus., Inc. v. Lockformer Co.*, 946 F.2d 1528, 1531 (Fed. Cir. 1991).

35. According to the Federal Circuit,

> one must consider the level of skill in the relevant art in determining whether a specification discloses the best mode. . . . [W]hether a best mode disclosure is adequate, that is, whether the inventor concealed a better mode of practicing his invention than he disclosed, is a function of not only what the inventor knew but also how one skilled in the art would have understood his disclosure.

Chemcast Corp. v. ARCO Indus. Corp., 913 F.2d 923, 927 (Fed. Cir. 1990). In the case at bar, at the time of the invention it was known to one of ordinary skill in the art that under conditions of amino acid starvation the operons of certain amino acids were positively regulated by the product of the *relA*$^+$ gene. (¶ 76) The parties' experts agree that one of skill in the art at the time of the invention, being familiar

with the literature, would have been able to determine the best mode of practicing the '765 claimed invention. (¶ 77)

36. The only mode for practicing the invention disclosed in the '765 patent is the description in the specification of the preparation of strains VL334(pYN6) and VL334(pYN7). (¶ 79; JX 1) These strains were the only reductions to practice contemplated by the inventors at the time of the filing of the application. Although the specification does not expressly characterize the recipient strain VL334 as being *relA*$^+$, it is undisputed that the parent strain of VL334, MG422, is *relA*$^+$; thus, absent any indication of change to the *relA* gene, one skilled in the art would know that VL334 was also *relA*$^+$ (¶ 79) Moreover, the literature in evidence indicates that the *relA*$^+$ gene is inherently present in incomplete isoleucine auxotrophs, such as VL334. (¶ 78) Thus, this is not an instance in which an inventor failed to disclose a non-claimed element that was necessary to practice the inventor's contemplated best mode. Rather, given the specification and the level of understanding in the art, a skilled practitioner would have readily recognized the allelic state of the *relA* gene in the disclosed strains and would have been able to practice the best mode of carrying out the claimed invention. Accordingly, the court concludes that ADM has failed to prove by clear and convincing evidence that the inventors failed to disclose the best mode of practicing the '765 patent.

37. **Enablement—By Overbreadth.** ADM argues that the '765 patent is invalid as not enabled pursuant to 35 U.S.C. § 112. Specifically, ADM contends that the method of preparing bacterial strains set forth in the '765 patent is unpredictable and unreliable, so that it would require undue experimentation for one skilled in the art to apply the teachings of the '765 patent to strains other than *E. coli* or amino acids other than threonine.

38. Section 112 mandates that a patent's specification

> contain a written description of the invention, and of the manner and process of making and using it, in such full, clear concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same. . . .

35 U.S.C. § 112. This section requires that there be sufficient disclosure, either through illustrative examples or written description, to teach one skilled in the art how to make and use the invention as broadly as it is claimed. *See In re Vaeck*, 947 F.2d 488, 496 (Fed. Cir. 1991). However, "it is not necessary that a patent applicant test all the embodiments of his invention; what is necessary is that he provide a disclosure sufficient to enable one skilled in the art to carry out the invention commensurate with the scope of his claims." *Amgen, Inc.*, 927 F.2d at 1213; *accord In re Vaeck*, 947 F.2d at 496 ("It is well settled that patent applicants are not required to disclose every species encompassed by their claims, even in an unpredictable art."). A patent need not teach that which is well known in the art. *See Lindemann Maschinenfabrik GMBH*, 730 F.2d at 1463.

39. The fact that some experimentation is necessary does not preclude enablement as long as the amount of experimentation is reasonable given the nature of the invention and the state of the art. *See In re Wands*, 858 F.2d 731, 737-38 (Fed. Cir. 1988).

> The determination of what constitutes undue experimentation in a given case requires the application of a standard of reasonableness, having due regard for the nature of the invention and the state of the art. The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed. . . .

> Factors to be considered in determining whether a disclosure would require undue experimentation . . . include (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.

Id. at 737 (citations omitted). ADM has the burden of proving these facts by clear and convincing evidence. *See Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 941 (Fed. Cir. 1990).

40. Claims 1 and 2 of the '765 patent are generic claims directed to a method for constructing bacterial strains possessing increased productivity of a selected amino acid. Given the number of different bacterial species known to exist at the time of the invention and the number of amino acids, in theory the process of claims 1 and 2 covers at least 1 million possible different combinations of bacterial species and amino acids. The specification of the '765 patent provides a general description of the method and three working examples. These three examples cover a single bacterial strain, *E. coli*, and a single amino acid, threonine.

41. Ajinomoto contends that the '765 patent is a pioneering invention and as such it is entitled to claims of broad scope. A pioneer patent

> is commonly understood to denote a patent covering a function never before performed, a wholly novel device, or one of such novelty and importance as to mark a distinct step in the progress of the art, as distinguished from a mere improvement or perfection of what had gone before. Most conspicuous examples of such patents are the one to Howe, of the sewing machine; to

> Morse, of the electrical telegraph; and to Bell, of the telephone.

Boyden Power-Brake Co. v. Westinghouse, 170 U.S. 537, 561-62 (1898); *accord Schneider (USA) Inc. v. Cordis Corp.*, 29 U.S.P.Q.2d 1072, 1075 (D. Minn. 1993). The Genetika researchers were not the first to use recombinant DNA technology. (¶ 8) However, whereas other researchers were applying recombinant DNA technology to the development of pharmaceuticals, the Genetika researchers were the first to apply this technology to the production of enzymes and amino acids. (¶ 8) Dr. Falkinham testified, without contradiction by Dr. Rudolph, that the '765 patent was a pioneering patent because

> it took the recombinant DNA technology and now applied it to a technology[,] fermentation technology[,] in which the two fields have really never been brought together before.

(D.I. 316 at 1510). Given the novel nature of the claimed invention, the '765 patent deserves pioneer patent status. When the court is confronted with a pioneer patent, " 'liberality becomes the keynote of construction requiring the court to give the patentee a wide breadth of protection in construing the patent claims and specifications. . . .'" *Ziegler v. Phillips Petroleum Co.*, 483 F.2d 858, 870 (5th Cir. 1973) (quoting *Corning Glass Works v. Anchor Hocking Glass Corp.*, 374 F.2d 473, 476 (3d Cir. 1967).

42. Here, the inventors have set forth the manner by which bacterial strains having an increased productivity of a selected amino acid can be constructed. The level of skill in the art at the time when the application was filed was high. According to the record, all of the methods needed to practice the invention were well known to those skilled in the art. (¶¶ 61-62, 66) Despite the diversity existing among bacteria, practitioners of this art were prepared to carry out the

identification, isolation, recombination, and transformation steps required to practice the full scope of the claims. (¶¶ 61-62, 66) The mere fact that in practice the method involved repetitive experimentation does not make it undue where such experimentation is routine. *See Johns Hopkins University v. CellPro*, 931 F. Supp. 303, 322, 324 (D. Del. 1996). Even though the record indicates that research efforts were ongoing regarding transformation techniques and the development of appropriate plasmids for some bacterial strains other than *E. coli* and for amino acids other than threonine, these limited examples are an insufficient basis on which to conclude that the methodology necessary for practicing the '765 patent was not generally known and routine by 1978. Likewise, the fact that in the relatively few examples cited by ADM the genes controlling the synthesis of the selected amino acid were not contiguous is insufficient to render the claims nonenabled given the breadth of the combinations ostensibly covered by claim 1.

43. Reasonably interpreted, the evidence indicates that the amount of effort needed to practice the method set forth in the '765 patent was not excessive. Given the disclosure in the specification of the '765 patent and the level of skill in the art at the time of the invention, ADM has not proven by clear and convincing evidence that one skilled in the art at the time of the invention would not have been capable of following the inventor's instructions in order to realize the bacterial strains without undue experimentation. Accordingly, the court concludes that ADM has not carried its burden of demonstrating that the '765 patent is not enabled by its disclosure.

44. **Enablement—By Deposit.** The placement of micro-organism samples in a public depository "has been considered adequate to satisfy the enablement requirement of 35 U.S.C. § 112, when a written description alone would not place the invention in the hands of the public and physical possession

of a unique biological material is required." *Amgen, Inc.*, 927 F.2d at 1210.

> A deposit has been held necessary for enablement where the starting materials (i.e., the living cells used to practice the invention, or cells from which the required cells can be produced) are not readily available to the public. Even when starting materials are available, a deposit has been necessary where it would require undue experimentation to make the cells of the invention from the starting materials.

In re Wands, 858 F.2d at 735. For instance,

> [w]hen a biological sample required for the practice of an invention is obtained from nature, the invention may be incapable of being practiced without access to that organism. Hence the deposit is required in that case. On the other hand, when . . . the organism is created by insertion of genetic material into a cell obtained from generally available sources, then all that is required is a description of the best mode and an adequate description of the means of carrying out the invention, not deposit of the cells. If the cells can be prepared without undue experimentation from known materials, based on the description in the patent specification, a deposit is not required.

Amgen, Inc., 927 F.2d at 1211.

45. ADM asserts that the '765 patent is not enabled unless the deposits required by the original PTO Examiner have been maintained and are readily accessible to the public. Prior to trial, the court concluded that "there remains a question as to whether a biological sample is required for the practice of this invention." ADM failed to offer any proof at trial on this issue, relying solely on the PTO's rejection of claims 1-4 of the '765 patent application for failure to comply with M.P.E.P. 608.01(p) regarding deposit of the parent and newly

developed *E. coli* strains. At no point did ADM address the PTO's subsequent finding that the '765 patent was enabled without the required deposits. (¶ 68) Nor did ADM address its own expert's opinion that dependent claims 3 and 4 were enabled without deposits. (¶ 69)

46. ADM based its contention that the strains are not readily accessible to the public on Degussa's and Dr. Pardo's unsuccessful efforts to obtain the strains. These failed attempts are not sufficient to establish the unavailability of the strains. Although ADM refers to Degussa's and Dr. Pardo's efforts as "requests," these efforts are more accurately characterized as "inquiries" into the requirements for obtaining the strains from the depository. (¶¶ 70-73) Moreover, these inquiries were inappropriately made since they failed to comply with the terms of the Budapest Treaty. (¶¶ 70, 74) Furthermore, the Pardo inquiry does not on its face appear to seek any strain other than B3996. (¶ 72) Thus, the fact that Degussa and Dr. Pardo did not receive the "requested" strains is not indicative of the strains' purported unavailability. Accordingly, the court concludes that ADM has failed to establish by clear and convincing evidence that deposit of the strains was required to enable the claims and that the strain deposits are not publicly accessible.

3. 35 U.S.C. §§ 111, 115 and 116—Declaration Signatures.

47. ADM argues that the '765 patent is invalid because not all of the inventors signed the declarations personally in violation of the statutory requirements in 35 U.S.C. §§ 111, 115 and 116. As part of a patent application, the inventor or inventors are required to sign the inventor's oath and declaration. Specifically, Section 115 of the Patent Act provides that "[t]he applicant shall make oath that he believes himself to be the original and first inventor of the process . . . for which he solicits a patent. . . ." 35 U.S.C. § 115. Section

116 provides that "[w]hen an invention is made by two or more persons jointly, they shall apply for a patent jointly and each make the required oath. . . ." 35 U.S.C. § 116. Statutory exceptions to these requirements are found in 35 U.S.C. §§ 116-118 and implemented at 37 C.F.R. §§ 1.42, 1.42, and 1.47.[39] These exceptions allow someone other than the inventor to sign the oath and declaration if the inventor is dead, insane or legally incapacitated, refuses to sign, or cannot be found or reached after diligent effort. None of these exceptions are applicable to the present case. Sections

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[39] Section 116 of the Patent Act provides, in relevant part, the following:

> If a joint inventor refuses to join in an application for patent or cannot be found or reached after diligent effort, the application may be made by the other inventor on behalf of himself and the omitted inventor. . . . Whenever through error a person is named in an application for patent as the inventor, or through error an inventor is not named in an application, and such error arose without any deceptive intention on his part, the Commissioner may permit the application to be amended. . . .

35 U.S.C. § 116. Similar provisions exist in 37 C.F.R. § 1.47(a) (inventor refuses to sign or cannot be found). Section 117 of the Patent Act provides:

> Legal representatives of deceased inventors and of those under legal incapacity may make application for patent upon compliance with the requirements and on the same terms and conditions applicable to the inventor.

35 U.S.C. § 117. Similar provisions exist in 37 C.F.R. §§ 1.42 (inventor dead) and 1.43 (inventor insane or legally incapacitated). Section 118 of the Patent Act provides in part:

> Whenever an inventor refuses to execute an application for patent, or cannot be found or reached after diligent effort, a person to whom the inventor has assigned or agreed in writing to assign the invention or who otherwise shows sufficient proprietary interest in the matter . . . may make application for patent on behalf of and as agent for the inventor. . . .

35 U.S.C. § 118. Similar provisions exist in 37 C.F.R. § 1.47(b) (inventor refuses to execute application or cannot be found).

116, 251 and 256 of the Patent Act contain remedial provisions that allow for an error to be corrected if it was made without any deceptive intent.[40]

48. Despite the questionable authenticity of some of the signatures on the declarations, the court will not invalidate the '765 patent unless fraud or inequitable conduct was practiced or attempted on the PTO in connection therewith. *See Aktiebolag v. Waukesha Cutting Tools, Inc.*, 640 F. Supp. 1139, 1140-41 (E.D. Wis. 1966); *A.F. Stoddard & Co., Ltd. v. Dann*, 564 F.2d 556, 562-67 (D.C. Cir. 1977); *In re Bennett*, 766 F.2d 524, 526-28 (Fed. Cir. 1985). Without evidence of fraud or deceptive intent, the falsified[41] signatures are regarded as only technical errors and cannot be asserted as a basis for invalidating the patent. *See Aktiebolog*, 640 F. Supp. at 1141.

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[40] Section 251 provides in part:

> Whenever any patent is, through error without any deceptive intention, deemed wholly or partly inoperative or invalid, by reason of a defective specification or drawing, or by reason of the patentee claiming more or less than he had a right to claim in the patent, the Commissioner shall . . . reissue the patent for the invention disclosed in the original patent, and in accordance with the new and amended application. . . .

35 U.S.C. § 251. Section 256 provides in part:

> Whenever through error a person is named in an issued patent as the inventor, or through error an inventor is not named in an issued patent and such error arose without any deceptive intention on his part, the Commissioner may . . . issue a certificate correcting such error.
>
> The error of omitting inventors or naming persons who are not inventors shall not invalidate the patent in which such error occurred if it can be corrected as provided in this section.

35 U.S.C. § 256.

[41] Although the word "false" often implies an intent to deceive, the court specifically disavows that meaning in the context of this decision.

49. In the case at bar, ADM alleges that the circumstances surrounding the false signatures establishes that the Russian inventors had a deceptive intention when they filed the declarations. Specifically, ADM argues that (1) there was no indication on the Supplemental English Declaration that the signatures were not genuine; and (2) by filing the falsely signed declarations, the inventors were able (a) to claim the Soviet priority date and (b) to overcome the § 112 rejection of the patent application. These circumstances alone are not sufficient to establish an intent to defraud the PTO on the part of the inventors. Although ADM claims, as further evidence of the inventors'deceptive intention, that Ajinomoto has made no effort to correct the defective patent, Ajinomoto has, in fact, filed a Supplemental Declaration with the PTO in order to rectify the signature discrepancies. (¶ 23) ADM has the burden to show, by clear and convincing evidence, that there was a deceptive intent in falsifying the inventors' signatures. ADM has failed to carry its burden. Consequently, the court shall not invalidate the '765 patent based on the questionable authenticity of some of the signatures on declarations submitted to the PTO.

4. Inequitable Conduct.

50. ADM argues that the '765 patent is unenforceable because the inventors failed to provide the PTO with the Genetika references; (2) misrepresented and failed to properly provide the PTO with the Kozlov reference; and (3) withheld the best mode of practicing the invention.[42] ADM contends the inventors' intent was to deceive the PTO. The defense of inequitable conduct requires proof, by clear and convincing evidence, of the failure to disclose material information that was known or should have been known to the patentee or the submission of false material information to

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[42] Because ADM failed to demonstrate that the inventors concealed the best mode of practicing the '765 patent, this issue is moot.

the PTO with the intent to mislead. *See N.V. Akzo v. E.I. duPont de Nemours*, 810 F.2d 1148, 1153 (Fed. Cir. 1987).

51. The Federal Circuit has set forth a two-step analysis for evaluating the defense of inequitable conduct:

> [First, t]he trial court must discern whether the withheld references satisfy a threshold level of materiality. The court must also determine whether the applicant's conduct satisfies a threshold showing of intent to mislead. . . . Next, assuming satisfaction of the thresholds, the trial court must balance materiality and intent. The more material the omission, the less culpable the intent required, and vice versa.

Halliburton Co. v. Schlumberger Techn. Corp., 925 F.2d 1435, 1439 (Fed. Cir. 1991) (footnote and citations omitted). The determination of inequitable conduct is within the discretion of the trial court. *See id.* at 1439-40; *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1395 (Fed. Cir. 1988) ("The court is charged with reaching an equitable result in view of the particular circumstances of the case.").

52. **Materiality.** In this context, facts or information is material if there is

> a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent.

37 C.F.R. § 1.56 (1978). With respect to materiality, the only publications in dispute are the Genetika references. Although these articles do not teach or suggest the claimed invention, they do describe the donor and recipient strains used in the examples of the '765 patent. (¶ 49) They also describe the relevance of the allelic state of the *relA* gene to the over synthesis of threonine. (¶ 49) Genetika II was listed in the reference section and cited to in the specification of the

Russian priority patent. (¶ 10) There is nothing to suggest that a reasonable patent examiner would not consider the Genetika references important. However, given the fact that they do not teach or suggest the claimed invention, the degree of materiality is relatively low.

53. **Intent.** In addition to the materiality of the publications, to establish that the inventors acted inequitably, ADM must demonstrate that the inventors acted with an intent to deceive or mislead the PTO. *See Labounty Mfg., Inc. v. United States Int'l Trade Comm'n*, 958 F.2d 1066, 1076 (Fed. Cir. 1992). Because direct evidence of intent is rarely available, intent may be inferred from clear and convincing evidence of the surrounding circumstances. *See id.; Kingsdown Medical Consultants, Ltd. v. Hollister Inc.*, 863 F.2d 867, 873 (Fed. Cir. 1988), *aff'd*, 968 F.2d 1227 (Fed. Cir. 1992) ("Whether the intent element of inequitable conduct is present cannot always be inferred from a pattern of conduct that may be described as gross negligence. That conduct must be sufficient to require a finding of deceitful intent in the light of all the circumstances."). However, the determination that an undisclosed reference is material does not presume an intent to deceive. *See Halliburton Co.*, 925 F.2d at 1442. Furthermore, a showing that references with some degree of materiality were not disclosed is insufficient to establish inequitable conduct. *See id.*

54. In the instant action, it is undisputed that the inventors were aware of the Genetika references and the Kozlov article and did not provide copies of the articles to the PTO. (¶¶ 45, 48) However, the circumstances do not establish by clear and convincing evidence an intent to defraud the PTO on the part of the inventors. Genetika II and the Kozlov article were among the sixteen references identified in the Russian patent application. (¶ 10) The pertinent contents of these references were identified by reference numbers throughout the text of the specification of the Russian patent application, a certified

translation of which was included in the '765 patent application. (¶ 10) Although reference to Genetika II was omitted from the '765 patent application, the Kozlov article was cited in the specification of the U.S. patent application. (¶ 14) Thus, the Kozlov article clearly was disclosed to the PTO. *See* 37 C.F.R. § 1.97(a) (1978). With respect to Genetika II, its listing in the Russian priority document filed with the PTO does not support a conclusion of deliberate concealment despite the fact that it was not routine for PTO Examiners to examine the priority application. *See Demaco Corp.*, 851 F.2d at 1396.

55. ADM also contends that the inventors misrepresented the teachings of the Kozlov article to the PTO, thereby leading the Examiner away from the importance of the reference as prior art. ADM's assertion that the Kozlov article teaches how to prepare amino acid producing bacterial strains through genetic engineering is not supported by the record. (¶ 46) The Kozlov article sets forth a procedure for isolating specific chromosomal markers whereby a hybrid plasmid containing some of the genes necessary for amino acid production is used to transform an auxotrophic host. (¶ 46) Thus, the specification of the '765 patent correctly characterizes the importance of the Kozlov article. (JX 1 at col. 2, lines 37-44)

56. In light of the circumstances, the court concludes that the record does not support a finding of intent to deceive. Therefore, no balancing of materiality and intent is necessary. Accordingly, the court finds that ADM did not establish, by clear and convincing evidence, that the inventors engaged in inequitable conduct.

III. DAMAGES

1. Based on the foregoing, it is the court's conclusion that strains G472T23(pYN8), G472T23(pYNSTOP), and G472T23(pYNTE2) infringe claims 1 and 2 of the '765

patent. Accordingly, Ajinomoto is entitled to relief for ADM's infringement. Ajinomoto asserts that it is entitled to reasonable royalties,[43] enhanced damages, prejudgment interest, and injunctive relief.

A. Reasonable Royalty

2. The standard for damages for patent infringement is set forth in 35 U.S.C. § 284. Section 284 provides that a patent owner whose patent has been infringed is entitled to "damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court." The reasonable royalty provision in the statute provides the "floor below which damage awards may not fall." *Rite-Hite Corp. v. Kelly Co.*, 56 F.3d 1538, 1544 (Fed. Cir. 1995). The claimant bears the burden of proof on the issue of damages. *See, e.g., BIC Leisure Products, Inc. v. Windsurfing Int'l, Inc.*, 1 F.3d 1214, 1217 (Fed. Cir. 1993); *Fromson v. Western Litho Plate & Supply Co.*, 853 F.2d 1568, 1574 (Fed. Cir. 1988), *aff'd*, 909 F.2d 1495 (Fed. Cir. 1990).

3. A reasonable royalty is a measure of recovery "intended to provide a just recovery to persons who for evidentiary or other reasons cannot prove lost profits or an established royalty." *Hayhurst v. Rosen*, No. CV-91-4496, 1992 WL 123178, at *13 (E.D.N.Y. May 18, 1992). It is defined as "a hypothetical royalty **for the use of the patented technology by the infringer,** calculated as if the parties negotiated at arm's length as a willing licensor and a willing licensee on the date when the infringement began." *Rite-Hite*, 56 F.3d at 1576. Although this hypothetical negotiation is characterized as a willing licensee-willing licensor negotiation, "the result has more of the character of a forced settlement where neither

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[43] The court already has concluded that Ajinomoto is not entitled to lost profit damages. (D.I. 276)

party gets all it would wish." *Id.* Where, as here, the parties were previously not "willing," the court

> may consider additional factors to assist in the determination of adequate compensation for the infringement. These factors include royalties received by the patentee for the licensing of the patent in suit, opinion testimony of qualified experts, the patentee's relationship with the infringer, and other factors that might warrant higher damages.

Maxwell v. J. Baker, Inc., 86 F.3d 1098, 1109 (Fed. Cir. 1996) (citing *Georgia-Pacific Corp. v. United States Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970)). The determination of a reasonable royalty is based upon the totality of the evidence, and the court is "**not** limited to selecting one or the other of the specific royalty figures urged by counsel as reasonable." *Smithkline Diagnostics Inc. v. Helena Lab. Corp.*, 926 F.2d 1161, 1168 (Fed. Cir. 1991).

4. For purposes of the hypothetical negotiation, the '765 patent is deemed valid, enforceable, and infringed. *See TP Orthodontics Inc. v. Prof'l Positioners Inc.*, 20 U.S.P.Q.2d 1017, 1025 (E.D. Wis. 1991). In addition, the parties are presumed to know all the facts relevant to the negotiation. *See Georgia-Pacific Corp.*, 318 F. Supp. at 1121. Although the hypothetical negotiation is presumed to take place on the eve of first infringement, the court is permitted to consider facts and events that occurred after infringement began even though those facts could not have been known by the hypothesized negotiators. *See Fromson*, 853 F.2d at 1575.

5. In the instant action, the hypothetical negotiations would have taken place in May 1993, just prior to ADM's first infringing sale. (D.I. 311 at 596; D.I. 315 at 1279) The parties each produced an expert who analyzed the relevant factors and provided an opinion as to the amount of a reasonable royalty. Dr. Bruce E. Stangle, testifying on behalf

of Ajinomoto, opined that the reasonable royalty rate at the time of infringement would have been a flat royalty of at least $2.00/kg.[44] (D.I. 311 at 596) Dr. Strangle's opinion is based primarily upon the average profit/kilogram of threonine that Ajinomoto's partially-owned subsidiary, Eurolysine S.A,[45] experienced in 1993. (D.I. 311 at 600-01, 628-29) Dr. Julie L. Davis, testifying on behalf of ADM, opined that the rate would have been a running royalty rate of 3.25% of net sales. (D.I. 315 at 1304-05, 1353-56) Dr. Davis' opinion was primarily based upon the existing royalty rate negotiated between Ajinomoto and Eurolysine. (D.I. 315 at 1303-06, 1353-56)

6. In attempting to calculate a reasonable royalty in this case, the court relies on the opinion testimony of the qualified experts and the record before it to establish what would have been known and considered by the parties at the hypothetical negotiation. The parties would have considered, *inter alia*, the following:

- Genetika licensed the '765 patent technology to Ajinomoto in 1982 for a negotiated royalty rate of 3% of net sales. (PX 3; ¶¶ 84-88) This license was exclusive with respect to sales in Japan, the United States, France, the United Kingdom, and Italy. (PX 3; ¶¶ 85-86) In 1994 the license was amended, reducing the royalty rate to 2% of net sales. (D.I. 311 at 465; JX 5; ¶¶)

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[44] Dr. Jungi Nakamura, the head of development of Ajinomoto's Feed Additive Department, testified that Ajinomoto would have wanted a minimum royalty of $7.00/kg in any negotiation with ADM in 1993. (D.I. 310 at 503) According to Dr. Nakamura, a lower royalty rate would not have prevented ADM's entry in the market. (D.I. 310 at 504)

[45] Eurolysine, a French corporation, was formed in 1973 as a joint venture between Orsan, another French corporation, and Ajinomoto. (D.I. 276 at 2) Ajinomoto owns 20% of Orsan as well. (D.I. 276 at 2 n.2)

- By May 1993, Ajinomoto had licensed its threonine technology only to Eurolysine. The negotiated royalty rate was 5.0% subject to various performance guarantees, with 3.25% being the minimum royalty. (D.I. 309 at 451- 452; JX 3 at 5-6) In addition, Eurolysine made an up-front payment to Ajinomoto of $1.9 million. (JX 3 at 5) At the time of the negotiation, Ajinomoto owned 50% of Eurolysine. (D.I. 315 at 1282) Effective January 1, 1994, Ajinomoto became a 75% owner of Eurolysine (effectively 80% due to its 20% ownership of Orsan). (D.I. 308 at 348-49; DX 728)
- Ajinomoto, which had a general policy of not licensing its competitors, would have been reluctant to license ADM, a strong competitor. (D.I. 311 at 623-24)
- ADM was a strong, low cost producer of agricultural products because it produced its own raw materials and energy. (D.I. 312 at 820-24) Therefore, its production costs with respect to threonine were reduced. (D.I. 315 at 1328)
- ADM anticipated entering the threonine market by 1991. (D.I. 315 at 1274- 76; ¶¶ 100, 102) ADM had entered into an agreement with Kodak for the purchase and continued development of a bacterial strain capable of the commercial production of threonine. (D.I. 315 at 1274; ¶ 99) ADM considered the Kodak strain a viable alternative to the ABP strains, but felt that by using the ABP strains it was "possible to reduce threonine cost from $1.32 per pound to $0.76 per pound," a savings of $1.23/kg in production costs. (PX 625) As a result, ADM was willing to pay up to $5 million for the ABP technology. (PX 625)

- ADM had a reputation for cutting prices in order to obtain a market share. (D.I. 309 at 411; D.I. 311 at 603-04, 613, 659; D.I. 315 at 1348-50) In fact, ADM sold the threonine it manufactured using the ABP strains at a loss throughout 1993 ($1.4 million), 1994 ($2 million), and 1995 ($7.5 million). (D.I. 311 at 658; JX 8) Although ADM's threonine sales netted a loss of approximately $13 million through fiscal year 1995, ADM's lysine sales yielded profits of over $112 million in 1993-95. (JX 8) ADM believed that threonine sales would have a cross-marketing effect, increasing lysine sales by approximately 20%. (D.I. 311 at 659; D.I. 315 at 1320-21; PX 239; PX 439)

- In 1992 the average net selling price of threonine was 44 French francs ("FF"), and Eurolysine realized an average profit of $1.70/kg of threonine. (D.I. 311 at 650; D.I. 315 at 1280) In 1993 there was a rise in the price of threonine to 53 FF because production problems at Eurolysine caused a shortage of threonine and demand for threonine was increasing rapidly. (D.I. 311 at 599, 607, 617) In that year, Eurolysine's average profit was approximately $2.00/kg of threonine. (D.I. 315 at 1280) The price of threonine rose until early 1994. (D.I. 316 at 415) Thereafter, the price of threonine fell in response to ADM's price cutting. (D.I. 311 at 617-18)

- Eurolysine suffered a loss of $48-70 million in price erosion damages and $36 million in lost sales following ADM's entry into the threonine market. (D.I. 311 at 593, 619)

- ADM did not need strains or technological know-how or assistance as it already had ABP's strains. All ADM required was permission to use the '765 patent. (D.I. 315 at 1291-92)

7. After careful consideration of the record before it, the court finds that if Ajinomoto and ADM had engaged in a hypothetical negotiation in May 1993 to determine the appropriate rate for a license of the '765 patent, the parties would have settled on a fixed royalty rate of $1.23/kg of threonine.[46] Despite the fact that in its license agreements with Genetika and Eurolysine (both non-competitors), Ajinomoto agreed to pay and receive a percentage of sales price royalty, the court concludes that in the case at bar, a fixed per unit rate of royalty is appropriate. Given the competitive relationship between the parties, ADM's known willingness to entertain short term losses in order to gain market share, and ADM's apparent low production costs with respect to threonine, the court finds that Ajinomoto would have insisted upon a fixed rate royalty.

B. Enhanced Damages—Willful Infringement

8. Ajinomoto contends that ADM willfully infringed the '765 patent, warranting enhanced damages and attorneys' fees. Pursuant to 35 U.S.C. § 284, a court may in its discretion "increase the damages up to three times the amount found or assessed." The Federal Circuit has set forth a two-step analysis a court should employ in exercising its discretion:

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[46] This rate corresponds to the savings in production costs ADM predicted it would realize by purchasing the ABP technology. (PX 625) Although the "licensing rule of thumb" dictates that only one-quarter to one-third of the benefit should go to the owner of the technology (D.I. 315 at 1294-95), given ADM's relatively low production costs and its belief that the sale of threonine would increase the sale of lysine, the court concludes that ADM would have been willing to share all of the benefit with Ajinomoto and that Ajinomoto would have settled for nothing less.

> First, the fact-finder must determine whether an infringer is guilty of conduct upon which increased damages may be based. If so, the court then determines, exercising its sound discretion, whether, and to what extent, to increase the damages award given the totality of the circumstances.

Jurgens v. CBK, Ltd., 80 F.2d 1566, 1570 (Fed. Cir. 1996). A finding that an infringer acted willfully or in bad faith may entitle an aggrieved party to increased damages. Because an infringer's egregious conduct in infringement litigation is not related to the underlying act of infringement or the infringer's culpability, it is an insufficient basis on which to justify increased damages under § 284. *See id.* at 1570-71.

9. The test for willful infringement is " 'whether, under all the circumstances, a reasonable person would prudently conduct himself with any confidence that a court might hold the patent invalid or not infringed.'" *Hall v. Aqua Queen Mfg., Inc.*, 93 F.3d 1548, 1555 (Fed. Cir. 1996) (quoting *State Indus., Inc. v. Mor-Flo Indus., Inc.*, 883 F.2d 1573, 1581 (Fed. Cir. 1989)). In examining the totality of the circumstances the court should consider

> 1) the infringer's deliberate copying of the ideas of another; 2) the infringer's knowledge of the patent rights of another; 3) any good faith belief of invalidity or non-infringement formed by the infringer after an investigation of the patent rights of another[;] and 4) the infringer's behavior as a litigant.

E.I. dupont De Nemours & Co. v. Monsanto Co., 903 F.Supp. 680, 740 (D. Del. 1995), *aff'd*, 92 F.3d 1208 (Fed. Cir. 1996). In the instant action, Ajinomoto bears the burden of proving by clear and convincing evidence that ADM acted willfully in infringing the '765 patent. *See id.*

10. It is undisputed that ADM had knowledge of Ajinomoto's '765 patent rights when it acquired the ABP strains. (¶¶ 97-98, 103) ADM also was aware at the time of purchase that ABP had acquired the Genetika technology, specifically the strain G472T23(pYN8). (¶ 110) At no time did ADM seek an opinion of counsel with respect to the ABP strains and their possible infringement of the '765 patent rights.

11. Actual notice of another's patent rights imposes an affirmative duty of due care upon the potential infringer to avoid infringement. *See Jurgens*, 80 F.3d at 1570. This duty includes "seeking and obtaining competent legal advice before engaging in activity that may result in infringement." *Stryker Corp. v. Intermedics Orthopedics, Inc.*, 96 F.3d 1409, 1414 (Fed. Cir. 1996) (quoting *Electro Med. Sys. S.A. v. Cooper Life Sciences*, 34 F.3d 1048, 1056 (Fed. Cir. 1994)). There is, however, no "absolute requirement that a would-be defendant aware of another's patent obtain its own opinion letter in order to immunize itself from a finding of willful infringement." *Hall*, 93 F.3d at 1555. Instead, a court must look to the totality of the circumstances in determining whether an infringer discharged the duty of due care. *See Monsanto Co.*, 903 F.3d at 742.

12. Based upon its review of the totality of the circumstances, the court concludes that Ajinomoto has not satisfied its burden of establishing by clear and convincing evidence that ADM willfully infringed the '765 patent. As noted, although ADM's failure to seek an opinion of counsel is an important factor to consider, it is not dispositive. The evidence of record indicates that ADM had a good faith belief, based upon representations made to it by ABP's Dr. Skogman, that the Genetika-ABP agreement allowed ABP to export into the United States the "modified" threonine technology it had developed from the Genetika strains. (¶¶ 90, 114, 121) This belief is bolstered by the fact that Genetika

had knowledge of ABP's sale of the technology through Dr. Debabov yet never protested the sale. (¶ 121) In addition, as evidenced by the voluminous record developed during this litigation, ADM put on a substantial challenge to the existence of infringement and to the validity of the '765 patent. Accordingly, the court concludes that Ajinomoto is not entitled to an enhanced damages award.

13. Likewise, the court declines to find that this case is an "exceptional case" under 35 U.S.C. § 285. Section 285 provides that "in exceptional cases [the court] may award reasonable attorney fees to the prevailing party." The purpose of this section is to compensate "the prevailing party for its monetary outlays in prosecution or defense of a suit where the conduct of the losing party is clearly inequitable." *Multi-Tech, Inc. v. Components, Inc.*, 708 F. Supp. 615, 620 (D. Del. 1989). The Federal Circuit has broken the standard down into four parts:

> (1) the case must be exceptional; (2) the district court may exercise its discretion; (3) the fees must be reasonable; and (4) the fees may be awarded only to the prevailing party.

Machinery Corp. of America v. Gullfiber AB, 774 F.2d 467, 470 (Fed. Cir. 1985). In general, for a case to be deemed exceptional there must be some finding, by clear and convincing evidence, of unfairness, bad faith, inequitable conduct, vexatious litigation, or some similar exceptional circumstances. *See Advance Transformer Co. v. Levinson*, 837 F.2d 1081, 1085 (Fed. Cir. 1988); *Stevenson v. Sears, Roebuck & Co.*, 713 F.2d 705, 713 (Fed. Cir. 1983); *Multi-Tech, Inc.*, 708 F.Supp. at 620. In the instant action, the court concludes that Ajinomoto has not satisfied its burden of establishing by clear and convincing evidence that ADM's actions make this case an exceptional one. Accordingly, the court shall deny Ajinomoto's request for attorneys' fees.

C. Prejudgment Interest

14. The Supreme Court has held that, when infringement is found, prejudgment interest should be awarded absent some justification for withholding such an award. *See General Motors Corp. v. Devex Corp.*, 461 U.S. 648, 657 (1983). Specifically, the Court stated that given the "overriding purpose of affording patent owners complete compensation," an award of prejudgment interest is ordinarily warranted since

> in the typical case an award of prejudgment interest is necessary to ensure that the patent owner is placed in as good a position as he would have been in had the infringer entered into a reasonable royalty agreement. An award of interest from the time that the royalty payments would have been received merely serves to make the patent owner whole, since his damages consist not only of the value of the royalty payments but also of the forgone use of the money between the time of infringement and the date of judgement.

Id. at 655-656 (footnote omitted). Thus, the court must determine which rate of interest will best compensate Ajinomoto for the time value of money.

15. District courts have great discretion in the selection of interest rates and may award interest at or above the prime rate. *See Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 939 F.2d 1540, 1545 (Fed. Cir. 1991). In the instant action, Ajinomoto asserts that an appropriate interest rate is the three-month U.S. Treasury Bill rate. Ms. Davis used this rate when calculating prejudgment interest in her report. (PX 417, Ex. 7-1) The court, in its discretion, agrees with the parties that the prevailing three-month U.S. Treasury Bill rate is the appropriate rate for determining prejudgment interest.

D. Injunctive Relief

16. Ajinomoto seeks a permanent injunction enjoining ADM from infringing the '765 patent. Pursuant to 35 U.S.C. § 283, this court is authorized to "grant injunctions in accordance with the principles of equity to prevent the violation of any right secured by patent, on such terms as the court deems reasonable." Although the grant of an injunction is discretionary, generally courts will grant injunctive relief when infringement has been determined. *See, e.g., W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 842 F.2d 1275, 1281 (Fed. Cir. 1988). The Federal Circuit has indicated that once a finding of infringement has been made an injunction should issue absent a sufficient reason for denying it. *See id.* That the injunction might put the infringer out of business does not justify denial of the injunction. *See Windsurfing Int'l, Inc. v. AMF, Inc.*, 782 F.2d 995, 1003 n.12 (Fed. Cir. 1986). Accordingly, the court will grant a permanent injunction preventing ADM from infringing the '765 patent.

IV. CONCLUSION

For the reasons discussed, the court finds that in using strains G472T23(pYN8), G472T23(pYNSTOP), and G472T23(pYNTE2) defendant ADM has infringed claims 1 and 2 of the '765 patent in violation of 35 U.S.C. § 271(g). Further, the court finds the '765 patent valid and enforceable under 35 U.S.C. §§ 102 and 103. As a result of the finding of infringement, Ajinomoto is entitled to a permanent injunction preventing ADM from infringing claims 1 and 2 of the '765 patent. In addition, Ajinomoto is entitled to money damages to be calculated based upon a royalty rate of $1.23/kg of threonine sold by ADM since May 1993, plus prejudgment interest at the three-month U.S. Treasury Bill rate. Judgment shall be entered accordingly.

APPENDIX D

(District Court Order on Motion to Amend)

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

C. A. No. 95-218 (SLR)

AJINOMOTO CO., INC.,

Plaintiff,

v.

ARCHER-DANIELS-MIDLAND CO.,

Defendant.

ORDER

WHEREAS, in its motion for a protective order (D.I. 131) filed with the court on May 24, 1996, Archer-Daniels-Midland Co. ("ADM") sought to preclude Ajinomoto Co., Inc. ("Ajinomoto") from taking discovery on its "current threonine research and development activities," drawing a narrow distinction between such activities and its "current commercial threonine production"; and

WHEREAS, only five (5) months after filing its protective order, five (5) days after the court granted the order (D.I. 278), and two (2) days before the start of trial, ADM began use of a plasmidless strain ("culture 4") in the production of threonine at its Decatur, Illinois Bioproducts plant (a week-long scale-up test); and

WHEREAS, despite the fact that on October 26, 1996, two (2) days before the start of trial, ADM began to use culture 4 to produce threonine, all indications at trial were that the only strain ADM was "currently" or "to the present" employing in the commercial production of threonine was G472T23-(pYNTE2); and

WHEREAS, on the last day of trial, November 13, 1996, ADM not only discontinued the use of G472T23(pYNTE2) but also began a second scale-up test of culture 4—the only culture, according to recent information supplied the court, that ADM has used in the commercial production of threonine since the end of trial, with the exception of a brief period in January 1997; and

WHEREAS, ADM's "group leader of amino acid fermentation," who was "familiar with the strains that ADM ha[d] used to produce threonine," testified at trial on November 4, 1996 that "[c]urrently the [G472T23(pYN] TE2[)] strain was being "used today" by ADM in the commercial production of threonine, a technically correct, albeit misleading, statement regarding ADM's production given the time lag between the scale-up tests for culture 4; and

WHEREAS, apparently determining its discontinuation of G472T23(pYNTE2) in the commercial production of threonine to be insignificant or irrelevant information, ADM failed to disclose such to the court until March 27, 1998 when it filed its motion to amend the court's March 13, 1998 opinion and judgment (D.I. 333), arguing that there was "no evidentiary basis" for the court's finding that it had employed G472T23(pYNTE2) to produce threonine "until the present";[1] and

WHEREAS, given the above recited chronology of events and ADM's reliance on very fine distinctions concerning information to which only it was privy, the court concludes

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[1] ADM also requests that the court amend paragraph 23 of the Findings of Fact in the Court's March 13, 1998 opinion concerning Ajinomoto's Supplemental Declaration of 1996 (D.I. 331). What ADM requests in this regard is that the court merely recite the evidence of record rather than the findings to be drawn therefrom. This the court declines to do.

that ADM must pay royalties for that period of time it chose not to correct the record it created at trial;

THEREFORE, at Wilmington this 7th day of October, 1998;

IT IS ORDERED that ADM's motion to amend the court's March 13, 1998 opinion and judgment and for reargument (D.I. 333) is denied in part and granted in part.

IT IS FURTHERED ORDERED, in accordance with the court's March 13, 1998 opinion (D.I. 331), that damages are awarded in favor of plaintiff Ajinomoto and against defendant ADM, said damages to be calculated based upon a royalty rate of $1.23/kg of threonine sold by ADM from May 1993 until March 27, 1998, together with prejudgment interest at the three-month U.S. Treasury Bill Rate.

/s/ Sue L. Robinson
United States District Judge

APPENDIX E

(District Court Injunction)

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

C.A. No. 95-218 (SLR)

AJINOMOTO CO., INC.,

Plaintiff,

v.

ARCHER-DANIELS-MIDLAND CO.,

Defendant.

INJUNCTION

At Wilmington this 7th day of October, 1998, pursuant to the court's opinion and order dated March 13, 1998;

IT IS ORDERED that defendant Archer-Daniels-Midland Co., its officers, agents, servants, employees and attorneys and those persons in active concert or participation with them who receive actual notice of this order by personal service or otherwise are enjoined against infringement of claims 1 and 2 of United States Patent 4,278,765 until such time as said patent expires by:

1. Making, using, offering for sale, selling, or importing into the United States without authority bacterial strains G472T23(pYN8), G472T23(pYNSTOP), and G472T23-(pYNTE2); and

2. Making, using, offering for sale, selling, or importing into the United States without authority threonine produced using bacterial strains G472T23(pYN8), G472T23-(pYNSTOP), and G472T23(pYNTE2).

/s/ Sue L. Robinson
United States District Judge

APPENDIX F

(District Court Judgment)

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

C. A. No. 95-218 (SLR)

AJINOMOTO CO., INC.,

Plaintiff,

v.

ARCHER-DANIELS-MIDLAND CO.,

Defendant.

JUDGMENT

Pursuant to the Court's March 13, 1998 and October 7, 1998 ORDERS (D.I. 332, 350 and 351), judgment is hereby entered for plaintiff Ajinomoto Co., Inc. and against defendant Archer-Daniels-Midland Co. in the amount of $24,363,308.

/s/ Sue L. Robinson
United States District Judge

Date: December 18, 1998

APPENDIX G

(35 U.S.C. § 281)

UNITED STATES CODE ANNOTATED

TITLE 35. PATENTS

PART III—PATENTS AND PROTECTION OF PATENT RIGHTS

CHAPTER 29—REMEDIES FOR INFRINGEMENT OF PATENT, AND OTHER ACTIONS

Current through P.L. 106-274, approved 9-22-2000

§ 281. Remedy for infringement of patent

A patentee shall have remedy by civil action for infringement of his patent.

APPENDIX H

(35 U.S.C. §100(d))

UNITED STATES CODE ANNOTATED

TITLE 35. PATENTS

PART II—PATENTABILITY OF INVENTIONS AND GRANT OF PATENTS

CHAPTER 10—PATENTABILITY OF INVENTIONS

Current through P.L. 106-274, approved 9-22-2000

§ 100. Definitions

When used in this title unless the context otherwise indicates—

(a) The term "invention" means invention or discovery.

(b) The term "process" means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

(c) The terms "United States" and "this country" mean the United States of America, its territories and possessions.

(d) The word "patentee" includes not only the patentee to whom the patent was issued but also the successors in title to the patentee.

(e) The term "third-party requester" means a person requesting ex parte reexamination under section 302 or inter partes reexamination under section 311 who is not the patent owner.

APPENDIX I

(35 U.S.C. § 261)

UNITED STATES CODE ANNOTATED

TITLE 35. PATENTS

PART III—PATENTS AND PROTECTION OF PATENT RIGHTS

CHAPTER 26—OWNERSHIP AND ASSIGNMENT

Current through P.L. 106-274, approved 9-22-2000

§ 261. Ownership; assignment

Subject to the provisions of this title, patents shall have the attributes of personal property.

Applications for patent, patents, or any interest therein, shall be assignable in law by an instrument in writing. The applicant, patentee, or his assigns or legal representatives may in like manner grant and convey an exclusive right under his application for patent, or patents, to the whole or any specified part of the United States.

A certificate of acknowledgment under the hand and official seal of a person authorized to administer oaths within the United States, or, in a foreign country, of a diplomatic or consular officer of the United States or an officer authorized to administer oaths whose authority is proved by a certificate of a diplomatic or consular officer of the United States, or apostille of an official designated by a foreign country which, by treaty or convention, accords like effect to apostilles of designated officials in the United States, shall be prima facie evidence of the execution of an assignment, grant or conveyance of a patent or application for patent.

An assignment, grant or conveyance shall be void as against any subsequent purchaser or mortgagee for a valuable consideration, without notice, unless it is recorded in the

Patent and Trademark Office within three months from its date or prior to the date of such subsequent purchase or mortgage.

APPENDIX J

(35 U.S.C. § 284)

UNITED STATES CODE ANNOTATED

TITLE 35. PATENTS

PART III—PATENTS AND PROTECTION OF PATENT RIGHTS

CHAPTER 29—REMEDIES FOR INFRINGEMENT OF PATENT, AND OTHER ACTIONS

Current through P.L. 106-274, approved 9-22-2000

§ 284. Damages

Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court.

When the damages are not found by a jury, the court shall assess them. In either event the court may increase the damages up to three times the amount found or assessed. Increased damages under this paragraph shall not apply to provisional rights under section 154(d) of this title.

The court may receive expert testimony as an aid to the determination of damages or of what royalty would be reasonable under the circumstances.

APPENDIX K

(PTO Rule 54)
(37 C.F.R. § 3.54)

CODE OF FEDERAL REGULATIONS

TITLE 37—PATENTS, TRADEMARKS, AND COPYRIGHTS

CHAPTER I—UNITED STATES PATENT AND TRADEMARK OFFICE, DEPARTMENT OF COMMERCE

SUBCHAPTER A—GENERAL PATENTS

PART 3—ASSIGNMENT, RECORDING AND RIGHTS OF ASSIGNEE

DATE AND EFFECT OF RECORDING

Current through December 5, 2000; 65 FR 76114

§ 3.54 Effect of recording.

The recording of a document pursuant to § 3.11 is not a determination by the Office of the validity of the document or the effect that document has on the title to an application, a patent, or a registration. When necessary, the Office will determine what effect a document has, including whether a party has the authority to take an action in a matter pending before the Office.